LIBRARY OF CONGRESS COPYRIGHT. 201882 12460 WASHINGTON

REVIEW OF THE

TELEGRAPH AND TELEPHONE

A JOURNAL OF ELECTRICAL, SCIENTIFIC AND MECHANICAL NEWS.

Vol. 1, No. 10. NEW YORK, JULY 1, 1882. $2.00 Per Annum. Single Copies, 10 Cents.

Copyright, 1882, by GEORGE WORTHINGTON. Entered at Post Office, New York, as Mail Matter of the Second Class

Let us All be Gypsies.

(From the Boston *Transcript*.)

Which is the way from the crowded city,
To the land of shadow and hope and peace,
Where women can love and men can pity,
And tears from sorrowing eyes may cease?
For the toiling town is harsh and hollow,
And Hate points eastward, Envy west;
Though many may fall, yet some will follow
To a home of dreams and the haven of rest.
For the love o heaven, stretch forth your hand,
And point the way to Bohemia's land.

Where are the fields and their emerald cover,
The wayside flowers and the traveling cart,
The new-found love and the long-tried lover?
They are better by far than our feverish art.
We are sick unto death of Jealousy's fetter,
The secret pain, the ceaseless strife.
There's triumph in fame, but freedom's better;
So give us a taste of a wandering life.
The senses sicken as Fancy's hand
Paints endless love in Bohemia's land.

Bohemia's ways are strewn with flowers,
Her children free from the revel of wine;
Her dust is slaked by the sweetened showers,
'Neath covering trees they halt and dine.
When care creeps close, why away they wander
To seek whatever the mind loves best;
For hope endures when the heart sees yonder
A brighter life and a surer rest.
How many despise, but how few withstand,
The ceaseless joys of Bohemia's land!

The Death Knell of Gas.

When we learn, as we do from recent European papers, that electric illumination has actually forced its way in amongst the gas works themselves, it is easy to perceive that the old tyrant is moribund. One of the most curious instances of the way in which electric lighting is gaining in favor is furnished by its introduction in the Amsterdam gas works, where, according to *l'Electricien*, a twenty-horse gas engine is used to run forty-eight Maxim incandescent lights, distributed in the office of the company, in the room of the manager, engineer, and in some parts of the works! Thirty-six cells of the Kabath storage battery are used to make the lamps, independent of the variations in the speed of the engine At the same time, news comes from all quarters of great improvements being made in the new method of illumination in the directions of simplification and efficiency, and especially in economy of cost. No wonder gas stock is falling all over Europe, and in New York and other large American centers of population; for these sounds, properly interpreted, are neither more nor less than the death knells of an ancient and behind-the-age monopoly.

International Exhibition of Electricity in Vienna.

In *La Lumiere Electrique* of the 3d inst., we read as follows: "A meeting has taken place in Vienna under the presidency of Baron Erlanger, in the buildings of the Bourse, with a view of making the preliminary arrangements for the International Exhibition of Electricity, which, as we have stated before, is to be held in that town during the months of September and October next. It was announced that the Minister of Commerce had authorized the installation of this exhibition in the Rotunde (a part of the Exhibition buildings of 1873) and that the Ministries of Commerce and War would be represented. Local committees are being formed already in Germany, France Holland, and a number of firms in England, America and Belgium, have intimated their intention to send apparatus. The General Committee of the International Exhibition of Electricity in Vienna consists at the present time of seventy-three members, and will be subdivided in a central committee of twenty five members.

A large canoe in excellent condition has been found near Bex, 4,000 feet above the sea level and nearly 3,000 feet above the valley of the Rhone. No Lacustrine relics have ever before been found in Switzerland at such an elevation.

Calling Currents and Different Methods of Producing Them.

One of the most important elements in the telephone business, whether carried on in the building and management of private lines or in the now world-renowned exchange system, is the absolute necessity of a call signal.

And this must be capable of application at either end of a line. It was early seen that to make the telephone practically useful as a medium of business communication some means must be provided to attract attention.

One of the first methods adopted in an exchange system was an induction coil and circuit breaker, at the central station, to call subscribers, and a press-button, which was adapted to break the circuit of a battery always on the line, was placed at the sub-stations. The receiving magnet at the central office was of high resistance, so as to be capable of remaining closed, or, speaking more correctly, of attracting its armature with a comparatively small battery. When the button was pressed the circuit was broken, and the annunciator drop would fall.

When the central-office operator manually vibrated the circuit breaker of his induction coil, very strong currents were generated in the secondary coil, which, acting on the subscribers' telephones, which were always in circuit, caused them to emit a loud, booming sound.

To make specific signals with this primitive apparatus, it was only necessary to add to it a key or circuit breaker in the secondary circuit, and the currents generated by the induction coil could be broken up, by making the required signal on the key, and a rude though rhythmical signal was thus caused to resound from all telephones in the circuit. It is plain that by this plan of signaling every subscriber on a circuit knew when any one was called and could go and listen, if it so pleased him or her, and sometimes it did so please him or her, and he or she did listen to their neighbors' business or pleasure, as it might happen to be.

Another method frequently adopted was that of keeping a sufficient battery on all the lines, and a bell at the central station as well as at the sub-stations, and it was surprising with what accuracy the operators would single out the bell that had rung, by the slight difference in tone between it and every other bell, of which there might be perhaps from twenty-five to a hundred.

It is very clear, however, especially when we look back, that both of these methods were eminently unsatisfactory, from several reasons; the former being too utterly crude, and also very risky in the summer for the telephone magnet helices, while the second method was costly in construction, costly in maintenance, and very hard in view of the numerous battery cells, requisite to keep clean and neat. Therefore a revolution soon took place in favor of magneto currents in signaling. It is not generally known that the first person in the world to signal by magneto currents was, according to the most authentic records, the same inventor and engineer who discovered the adaptability of the earth as a return circuit, *i. e.*, Steinheil.

Therefore it is by no means a new thing, as some suppose, to signal by magneto electricity.

Many of the later installed telephone exchanges started, from their first inception, to use magneto bells.

Two general types were more or less: used first, that with a polarized bell and armature pivoted on the center, in accordance with the invention of Watson, and for a generating device to call a central office, a compound permanent horseshoe magnet, and either a Siemens or a Saxton armature operated thereby, which of course generated currents of rapidly alternating direction.

Second, an instrument having the same style of polarized ringer, but instead of the crank or rotating

generator, they were provided with a lever arranged, when pressed, to forcibly detach an armature from the poles of a heavy horseshoe magnet; the poles of the magnet being previously fitted with soft iron cores surrounded by helices, placed, when operated, in the line circuit.

This separation produced a brief but intense current, which, vitalizing the central office magnet, caused the fall of the annunciator.

It will be noticed from the foregoing account that in both of these types of apparatus the ringing part was and is identical, so that any generator or source of electricity which could ring the one could ring the other.

When exchanges were small, and had not many lines, it was found sufficiently convenient to give each operator a hand generator, which had to be rotated when any subscriber was to be signaled, and many a weary arm and listless face was the legitimate result; the said result being no doubt accelerated by the delay of subscribers to promptly respond to their call.

This glaring grievance, it may be here interpolated, is rapidly becoming less, on account of the action of judicious and prudent superintendents who direct their operators to give a subscriber ample time to answer, and if he fails to do so, on the second or third ring, to announce to the calling subscriber, that Mr. Neverin does not answer.

However, the labor of the perpetual grind of the hand generators upon the operators, combined with the necessity of having something quicker and with more snap to it, started up the power generator idea. The power generator was simply a big horseshoe magnet with a Siemens armature, in a state of continuous rotation, this rotation being produced by any convenient source of power, brought by means of belts and pulleys to the armature which is provided with a pulley on its axis. One electrode or end of the armature coil is permanently connected with the ground; and the other extends out by a suitable wire to the central office switchboard, and there in branch wires to each operator's station or section; these branch wires terminate in anvils of strap keys, and of course by the usual devices (all of which are being daily patented by enterprising speculators) may be readily connected with any required line.

It is clear that a generator may be placed at the source of power within any reasonable distance from the exchange, and with proper care there is no reason why it should not give great satisfaction.

Complaint has, however, been made that the magneto current so generated, will not split to a sufficient degree to supply all the requisite calling power for a large exchange, and those who make this charge may very likely be suited better by another arrangement, which for the benefit of those who have it not, we will now briefly describe.

The polarized bell at each subscriber's station will, by reason of its polarity, respond to rapid alternating pulsations of electricity however produced, and although it was customary for a long time to associate them altogether, with a generator of magneto currents, and hence it received the common name of magneto bell; it is, and always has been clear to the electrical engineer, that alternating currents of sufficient strength developed from a battery would ring such bells, at least as well as magneto currents, and inasmuch as in many cases, power is not readily procured, battery power modified by a pole changer may often be profitably substituted for the magneto generator.

It is well known that a current coming from a battery is ordinarily of one direction.

Such a current passed through a polarized bell helix would not make it give more than one stroke; therefore we have to provide a pole changer, which is simply a machine adapted to continuously and rapidly reverse the battery, presenting alternately its positive and negative poles, to line, and ground. It is no new thing to send alternate battery currents to line, but it is, so far as we are aware, to do this by means of a small and compact, but perfectly reliable instrument, capable of being controlled by persons possessing ordinary skill in the business.

Such an instrument has been invented by E. P. Warner, of Chicago, and is manufactured by the Western Electric Co. It can generally be made operative by a couple of large gravity cells, and can reverse a battery of any number of cells and of any size.

It consists simply of a pendulum provided with a rod, on the upper end of which is an armature which vibrates between a pair of electro-magnets. The electro magnets are fixed to one end of a curved permanent magnet, and form a double extension of one of its poles. The pendulum rod and attached armature is fastened to the other end of the permanent magnet, and forms an extension of the other pole. The pendulum performs two functions: first, it directs the current of its small operating battery alternately through each of the electro magnets, causing them to become alternately energized, and so maintains its own motion by being attracted first to one side and then to the other; and after being once set in motion its own momentum aids it in making that motion continuous.

The second function of the rod is to reverse the line battery. To do this the pendulum rod itself is permanently connected with a ground wire, and a little metal post just behind it is in permanent connection with the main leading out wire, which can of course be put to any desired line. Two leaf springs are fixed to the base, in the path of the pendulum, one being connected with the plus, and the other with the minus pole of the line battery; and the whole apparatus is so adjusted that when the pendulum swings to one side, its rod makes contact with one of the battery springs, and allows the other spring to make contact with the line post; when the pendulum returns, the reverse is the case; and the springs are further so adjusted that the battery is never short circuited, and that the circuit is always opened for an instant before each reversal; so that even bells with neutral armatures may be rung by it.

Both magneto and battery pole-changers have their special friends and champions, and the most conflicting statements are made respecting the performances of each.

A great part of the liking for either instrument arises from purely personal taste, the old telegraphist generally preferring, as might be expected, the battery and pole-changer.

One man will aver that he has given the magneto driven by power a fair trial and he finds the current does not split. Another man finds that although he has twice the number of circuits to supply as No. 1, he has no trouble on that score whatever. Obviously there must be some reason for this difference in opinion.

In the humble opinion of the writer, many of the leading out wires from the generator have been made too small; and so, when the number of wires connected thereto has been increased so that their combined sectional area has greatly exceeded that of the main generator wire, the current has weakened; whereas, if the main wire had been larger, no such thing would have taken place.

Another thing has been defective ground wires. A power generator has often had to be placed a long way from the central station, and where any responsible officer does not perhaps see it, and the ground wire has not been properly constructed.

Again, it has often occurred that they have been made too large, and in constant running they have rapidly gone out of repair.

It is a good thing to have both magneto and pole-changer, as they can then be made to relieve one another.

The magneto has the advantage of being clean and requiring little attendance, while the battery and pole-changer's advantages are that it can be located at the office and be always under the eye of proper persons, and is not dependent upon outside power.

All things being equal, our own preference is for the magneto. If possible, we would not have it more than half a mile from the office, and preferably in the same building. This is done at Chicago, by using a gas engine as the source of power.

We would have its ground-wire frequently examined. We would have a large leading-out wire unusually well insulated; and we would, if necessary, prefer two or three small generators to one very large one.

In regard to the pole-changer, the only hints necessary are to keep the vitalizing battery even in strength, to keep the line battery always up to the mark, and to keep the instrument properly adjusted, running reasonably fast and the points clean. A good telephone man will get good work out of either apparatus.

Electricity and Gas.

On the respective dates of May 29th and June 1st, Messrs. McHardy & Crookes forwarded long and interesting letters to the *Times* on the above subject. It will be seen that we are gradually arriving at a clearer understanding as to the relative cost of the rival systems, and the advantage to be derived, from every point of view, by the use of electricity as a lighting agent, is becoming more and more apparent. If Mr. Crookes finds it economical to use the incandescent electric lamp for his private residence, heavily handicapped as he is with difficulties placed in his way, how much more economical will it be than gas at its present price when we have central works for supplying whole districts. That this will soon be accomplished we cannot doubt, and most of the principal witneses examined before the Electrical Lighting Committee declared that the only thing now required to enable the electric light to compete on favorable terms with gas, was the permanent establishment of central stations. Regarding the production of the current for electric lighting purposes we quite agree with Dr. Siemens when speaking of dynamo-electric machines: they are so good that it does not appear likely that any particular improvement can be made in them so as to effect more economically the conversion of mechanical into electrical energy, which Dr. Siemens says can now be performed with a loss of only 10 per cent.; their construction, however, may be modified and simplified, and their cost considerably reduced. Doubtless the attention of inventors would be better directed towards the perfecting of incandescent lamps, than in probably vain endeavors to produce better machines. We do not now, nor did we ever, believe that the consumption of gas would be reduced by the general adoption of the electric light, and we have every faith in the manifold uses to which gas may be put beyond those at presen texisting. In a former number of the *Electrical Review* we expressed a wish that we might shortly be enabled to arrive at that point of illumination where the costs of the two systems would be practically the same.

It has of course been long known that much more light could be produced from the energy contained in, say, 1,000 cubic feet of gas, by employing it as the driving power for a dynamo-electric machine, than by consuming it for direct lighting; and this favorable result can be obtained not merely by the employment of arc lamps, but also in a smaller degree by those of the incandescence type, giving each about 16 candle-power. If we allow 20 cubic feet per hour per horse-power—a very liberal margin for the "Otto" gas-engines of Messrs. Crossley Brothers, when working under the best conditions—we should obtain from 1,000 cubic feet of gas 50 horse-power.

One horse-power of energy will give us at the lowest estimate eight lamps of 16 candle-power each; or say, 130 candle power per horse-power, the total amount of light, therefore, being $130 \times 50 = 6,500$ candles Taking now the most favorable view of gas and allowing 5 cubic feet per hour for a 12 to 15 candle-power light, we have the total result of 2,400 to 3,000 candles. Therefore the incandescent electric light gives more than double the total illuminating power of gas, for a given quantity consumed, for producing lights of almost identical candle-power; or, in other words, the *ordinary* gas lighting of streets costs more than double that of the electric light when used for the same purpose and under similar conditions. According to the calculations of Mr. McHardy, the cost of gas *v.* electricity under such conditions as those above described is more than three times in favor of the electric light. We think, however, that his figures are incorrect as to the light emitted by an ordinary gas burner, the consumption of 5 to 8 cubic feet producing only 6 to 8 candle power being altogether erroneous. However, the experiment of Mr. Crookes, with all its adverse circumstances, shows that the consumption of 550 cubic feet of gas in his engine gives him a total light of 440 candles for five hours, whilst to get anything like an approach to this result by using the gas direct for illumination would necessitate the consumption of 750 cubic feet in the same time.

It follows from the figures we have given that at any stated candle-power the electric light should be cheaper than gas; but at present there remains a considerable gap between electric lighting by the incandescence and arc systems, and it is between these two points that gas has the advantage. We cannot safely work an incandescent lamp as high as 50 candle-power, and we cannot well reduce the arc lights below 400 candles or so. On the other hand, gas can be regulated to any desired intensity from one candle to 1,000 or more. Again, if we wish to lower the illuminating power of electric lamps it is generally effected by the insertion of some artificial resistance, but then we consume just as much power as if we were working up to the normal strength of our lights. The consumption of gas, however, is more in accordance with the illuminating power produced. It rests with electrical engineers to fill the gap at present existing between the maximum candle-power of an incandescent lamp which can be employed with safety, and the minimum light which is now produced by arc lamps, Of course, a number of the present incandescent lamps might be placed in one globe, so as to produce a light of 50, 100, or 400 candle-power, but this would not be an economical way of competing with gas; for it will be seen that according to Mr. McHardy's figures, in reference to the Siemens regenerative gas burner, that 55 cubic feet of gas consumed in an hour yields an illuminating power of 330 candles, or that the same volume of gas utilized in a gas engine for driving a dynamo-electric machine would produce about 360 candle-power, or but slightly in favor of lighting by electric incandescence with the present form of lamps. However, we think that the view is gradually gaining ground that gas might very well be left to itself for street lighting, and that the proper domain for the incandescent electric light is in-doors.

—*Electrical Review.*

The total product of gold in the United States in 1881 was $34,700,000 and of Silver $43,000,000. Colorado takes the first place among the producing States, with a yield of more than $20,000,000. California follows with nearly $19,000,000, and Nevada, which at one time ranked first, is now third, with a product of less than $9,000,000.

Western Union Stock, 84.
American District Telegraph Co., 45.

A Non-Electric Incandescent Lamp.

A bright light, easily obtained and sufficient for projections, has frequently been regarded as a *desideratum*, where it has been impracticable to procure either the electric or lime light. The French Minister of Public Instruction lately appointed a special commission to indicate the apparatus most suitable for projection in primary schools; and it appeared that while there was no lack of simple arrangements for the projection proper, the problem of easy production of an adequate luminous source was hardly solved.

Dr. Regnard has lately conceived the idea of getting a bright light by burning on platinum gauze a mixture of air and petroleum vapor. The intense heat which results raises the platinum to bright incandescence, giving a light equal to about half the lime light.

The apparatus (described in *La Nature*, to which we are indebted for the accompanying figure) is very simple. There is an ordinary Bunsen burner, terminated by a small cage of platinum wire. The mixture of air and petroleum vapor is admitted below, in place of the gas; it is produced by a familiar method and the current is generated by means of a pair of bellows or a Richardson "pear." With a ventilator or "trompe," several of the lamps may be maintained in action at once, for lighting halls, workshops,&c., where there is no gas. The aspect is that of electric incandescent lamps. In this case, it is well to augment the volume of the carbonator, so that the supply of petroleum vapor is abundant. To send all the light in one direction, the Bunsen burner may be fitted with a bent trumpet-shaped nozzle closed with platinum gauze. One has merely to regulate, with the ring of the burner, the admission of the mixture of air and vapor, to have, whenever the current is produced, an extremely bright light.

With a large loaded bag of air under the table the lamp may be kept in action several hours, without requiring attention.

The apparatus should be useful to medical men in examinaton of the larynx, ear, &c.

The expenditure is very small, only a few centimes an hour, with maximum action.

Relighting Safety Lamps by Electricity.

Safety lamps when extinguished by fire-damp must, as a rule, be taken to the surface to be relighted, and the loss of time and the expense which this proceeding entails, have caused Messrs. Hubert and Durant to propose a method of relighting safety lamps by electricity, and that without opening them or removing them from the air, which may at any moment become explosive. For this purpose the bottom or reservoir of the lamp is provided with two tubes of metals, closed by tightly-fitting wooden plugs These serve to hold and insulate two copper wires connected by a short platinum wire passing close to the wick. On making contact with a battery, the electric current raises the platinum wire to a white heat and lights the lamp. Various batteries have been tried for this purpose, but as portability and at the same time high power were required, the bichromate battery was ultimately selected. This consists of a glass cell with wide mouth, containing bichromate of potash and water acidulated with one-tenth its weight of sulphuric acid. Generally, one zinc and one carbon pole are immersed in this liquid; but, in order to increase the surface and therefore the intensity, Messrs. Hubert and Durant employ two zinc and four carbon plates. They also propose eventually to supersede the bichromate battery by that of Daniel, reinforced by a Faure accumulator. In order to avoid the sparks which are produced on breaking contact, and which would ignite an explosive mixture, two spiral springs hold the zinc and carbon plates clear of the exciting liquid, so that to make the current pass it is necessary to press the lamp firmly down upon the electrodes. As soon as the lamp is relighted the pressure on the electrodes is released; they rise from the liquid, the current no longer passes, and consequently no sparks are produced on breaking contact. Existing lamps may be modified, so as to be lighted by electricity, at a trifling cost, which, together with that of the battery, will soon be repaid by the saving of oil resulting from only lighting the lamps when they are required for use, instead of at the mouth of the shaft.

Small Dynamo-Electric Machine.

In the *Scientific American* supplement I described a small dynamo-electric machine, giving working drawings, together with all the particulars necessary to enable any machinist or amateur, whether familiar with electricity or not, to construct a working dynamo of small but practical size. This machine has been copied by a large number who have succeeded very well indeed; others, however, have failed. In the most of these failures of which I have been informed the cause has been evident enough, and should not have been overlooked by the builder of the machine.

One has an armature of very hard iron—a sufficient cause for failure, since the magnetization of the armature is reversed at each half revolution. Another has a wide space between the armature and the field magnet. Another finds the wires of his magnet wound so that both poles are alike. Another discovers that his armature is short-circuited, and another has found the same trouble in the wire of his field magnet. Still another finds that the commutator needs adjusting. Another has oiled the commutator, and there is not enough pressure on the commutator springs or brushes to press the oil out of the way, and the oil, being a good insulator, prevents the current from passing. Another finds fine particles of copper between the halves of the commutator; this, of course, short-circuits the armature. Another has varied the sizes of the wire on the magnet and armature. Some expect the machine to work through large external resistance, and so on. In nearly every case the only possible advice has been to follow the instructions given in the supplement referred to.

Several inquiries relating to the kind of wire gauge used in giving the sizes of the wire, the electrical resistance of the magnet and armature, and the performance of the machine in connection with Edison's lamps having been referred to me, I will briefly give the following points:

Field magnet wire, No. 16, American wire gauge.
" " between Nos. 17 and 18, English wire gauge.
" " 0.055 inch diameter.
" resistance of 1.9 ohms.
Armature wire, No. 18, American wire gauge.
" " " 19, English " "
" " diameter of 0.04 inch.
" resistance of 0.9 ohm.

The current from this machine will bring four Edison three-candle power lamps to incandescence, and will light two of them with great brilliancy, the machine being turned by hand. GEO. M. HOPKINS.

—*Scientific American.*

THE ELECTRIC LIGHT IN THEATERS.—On Monday, the 29th ult., Mr. F. Emery, the lessee of the Prince of Wales' theater, Liverpool, caused the whole of the auditorium to be illuminated by means of the Maxim electric light. The experiment was a complete success. The temperature of the theater was noticeably lower than usual. The electric light will be henceforth adopted at this house.

The steamship Alaska, which arrived on the 25th inst., beat all previous records. The voyage was made in 7 days, 2 hours and 20 minutes.

REVIEW
OF THE
Telegraph and Telephone,
(AN ELECTRICAL JOURNAL)

PUBLISHED SEMI-MONTHLY AT 23 PARK ROW.

P. O. BOX, 3329.

GEORGE WORTHINGTON, - Editor and Proprietor.

SUBSCRIPTION.

United States and Canada, $2.00 per annum, in advance.

Great Britain and other foreign countries, $2.50 = 10s. = 13 francs. Postage free.

ADVERTISING.

Transient rate, 35c. per line each insertion.
"Business specials," 50c. a line.

EDITORIAL ANNOUNCEMENT.

We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

Those desiring to recommend their goods can do so to any extent in our advertising columns, but we will not publish for pay anything of that nature in our reading columns.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address. Wm. Dawson & Sons, 121 Cannon Street, London, England, are our accredited representatives for Great Britain.

DEALERS SUPPLIED WITH THIS PAPER BY

The American News Company, New York.
The American News Company, Denver, Col.
The American News Company, Kansas City, Mo.
The American News Company, Omaha, Neb.
The American News Company, St. Paul, Minn.
The New York News Company, New York.
The National News Company, New York.
The New England News Company, Boston, Mass.
The Central News Company, Philadelphia, Pa.
The Western News Company, Chicago, Ill.
The St. Louis News Co., St. Louis, Mo.
The Cincinnati News Company, Cincinnati, Ohio.
The Detroit News Company, Detroit, Mich.
The Pittsburgh News Co., Pittsburgh, Pa.
The Baltimore News Company, Baltimore, Md.
The Rhode Island News Co., Providence, R. I.
The San Francisco News Co., San Francisco, Cal.
The Albany News Company, Albany, N. Y.
The Montreal News Company, Montreal, Canada.
The Toronto News Company, Toronto, Ontario, Canada.
Wm. Dawson & Sons, London, England.

NEW YORK, JULY 1, 1882.

CONTENTS.

Page.
Death Knell of Gas.....145
Calling Currents, Different Methods of Producing Them. By T. D. Lockwood.....145 & 146
Electricity and Gas. Relighting Safety Lamps by Electricity.....146 & 147
Mexican Telephone Interests.....148
Action of the Microphone. Reaction of Induced Currents. By F. W. Jones.....149
The Principle of Carbon Telephones. By Count Th. du Moncel.....150 & 151
Telephonic and Telegraphic Notes.....152
Miscellaneous Notes.....153 & 154
New Patents (U. S.).....155

Mexican Telephone Interests in Good Hands.

Among the passengers on board the S. S. City of Alexandria, which sailed June 22d for Vera Cruz, Mexico, was Mr. George L. Wiley, a gentleman long and favorably known to telegraphers and—since the inception of the telephone—to telephone men.

Mr. Wiley goes to Mexico to take charge, as Vice-President and General Manager, of the Central Telephone Company of Mexico, taking with him a strong corps of assistants.

The political and social condition of the Republic of Mexico is better to-day than at any time in its previous history, and the prospects of success for the new company, under Mr. Wiley's management, seem most flattering, while the large number of friends who assembled at the steamer to wish him "God speed" sufficiently indicates that such success would be pleasant news for those who have been associated with him here.

Mr. Wiley's experience in the telegraph began in June, 1869, when he entered the Gold and Stock Telegraph Company as clerk and operator, at their branch office in the New York Bank Clearing House. He served in all the intermediate grades until his appointment, in 1878, to the Superintendency, and as Superintendent until May, 1880, when the telephone branch of the Gold and Stock Company's business was consolidated with the Bell Company, of New York, forming the present Metropolitan Company. In this company he has served as Assistant General Superintendent until now. The claim is made for Mr. Wiley by his friends that he was the most popular Superintendent in the business, and, of our knowledge, we can say that he leaves a host of good friends and admirers in New York, and throughout the telephone and telegraph fraternity in the United States.

The New York Electrical Society.

The New York Electrical Society held its regular meeting in the new rooms of the society on Thursday evening, June 23d. The very sultry weather did not prevent a large attendance. On the platform and among the audience were several scientists of national reputation. The business of the society comprised a suitable resolution of respect to one of its Vice-Presidents, Mr. G. L. Wiley, who has removed to Mexico. The adoption of a resolution making the regular nights of meeting to occur on the *first* and *third* Friday of each month; the adjournment of the meetings over the hot season to the first Friday in September; and the announcement by the President that David Brooks, Esq., and Professor Elisha Gray have promised to lecture before the society in September, also that the rooms were now ready for the use of members for reading and library purposes. Professor A. E. Dolbear, of Tuft's College, Boston, was introduced, and gave a highly interesting lecture on the "Development of Telephony."

A brief historical account was given of the subject introducing the early attempts of Dr. Page, of Salem, Mass., with his bar of iron wound with a coil of wire, producing clicks when the bar was magnetized or demagnetized; also the experiments of Mr. Farrar of Keene, N. H., employing the vibrating armature of an electro-magnet to transmit sounds of varying pitch, and the efforts of this early investigator to accomplish a transmission of the human voice. The main figure in the history, however, was Phillip Reis, whose ingenious mind had solved the main problems of electrical telephony and transmission of speech. In addition to the current information we already possess of his wonderful achievments in this direction, Prof. Dolbear added much new data obtained by him through personal visits and correspondence with the cotemporaries of Reis and of those who had either assisted him or witnessed his experiments. It was shown that while mechanically the transmitter of Reis was a complete make and break device, it did not necessarily follow that it was so electrically, because the high tension current could easily cross the space made by a vibration of the diaphragm the same as it crosses in the voltaic arc.

Here Professor Dolbear exhibited several instruments, one of which had been made by the same person who had formerly constructed those used by Reis. By these instruments Professor Dolbear had repeatedly accomplished the transmission of distinct sentences.

As it was so clearly demonstrated how near Professor Reis had come to a solution of the great problem, having, in fact, within his own hands the necessary conditions and with slight modifications the appliances for reproduction of the voice at a distance, we were strongly reminded of Evangeline's search for Gabriel when he passed her on the father of waters as she slumbered in her boat concealed in the willows, so that now "the ward that floats on the surface is as the tossing buoy that betrays where the anchor is hidden."

Professor Dolbear, after giving due credit to Bell, Edison, Gray, Hughes and others, referred to his own contributions to the telephone, and displayed a new system worked up by himself. For simplicity and effectiveness it is a marvel. There is no transformation of electricity into magnetism in this system. There is only a single transformation, which is the electrical difference of potential itself, being transformed into motion without the intervention of magnetism.

For instance, *A* consists of a receiver of two plates in proximity, encased in hard rubber, having an opening on one side to listen at, and on the other side a knob for a handle.

The plates are separated and insulated from each other with an air space between, neither being able to go beyond a certain distance, and connected by suitable wire terminals.

These plates act upon the law that an electrified body will attract another body near it.

B represents the transmitter similar in some respects to that of Reiss. *C* is an induction coil the primary coil of which forms a circuit through a local battery and the carbon points, *p*. The secondary coil of about 2,500 ohms, connects with earth on one side, and on the other side with the wire leading to *A*, which may be many miles distant. This plan secures a high electro-motive force to charge one plate of receiver, *A* It will easily be seen that the second plate of *A*, next to the ear will be attached to the line-plate in exact conformity with the electrical variations in the wire, thus reproducing the vibrations set up in the diaphragm of *B*. We regret that our limited time before going to press prevents our getting up a diagram to illustrate the above.

One very instructive statement made by Professor Dolbear was that he had been able to hear sentences by placing merely in close proximity to the tympanum of his ear the end of a wire from a distant transmitter, and that he believed the charged wire acted on the tympanum by attracting it, thereby conveying to the auricular nerves the vibrations necessary to reproduce the sensations which interpret articulate speech.

A remarkable feature of the receiver was that it could be taken in the hand free from any wire connections whatever, and would distinctly articulate whatever was passing on a circuit in its vicinity. This is a well-known property of Bell's magnetic telephone, brought to the notice of the American Electrical Society in October, 1877, by Mr. E. M. Barton.

The lecture was replete with new ideas and delivered in a perspicuous style that gave pleasure and satisfaction.

A hearty vote of thanks was unanimously accorded Prof. Dolbear, and after some interesting remarks by Prof. Vanderweyde, J. D. Reid, Esq., F. L. Pope, Esq., and others, the meeting adjourned.

The Action of the Microphone.

It is well known that Professor Hughes, Mr. De la Rue, and others, have for several months past been engaged in investigating the true secret of the action of the microphone—a secret which, to many electricians, was never clearly explained by the existing theories, notwithstanding the pronunciamentas of some very high authorities in courts of law and elsewhere. It was held to be due to pressure varying the extent of surface contact between the two contiguous points forming the bad joints; but it was not easy to figure to oneself how pressure could account for it in the case of irregular jutting points, such as exist on gas carbon pencils, or in the grains of coke employed in certain telephone transmitters. Why should the irregular and loose surfaces vary the extent of surface contact just in proportion to the strength of the air waves beating on them and more? The answer is difficult to give; but the experiments of Professor Hughes and others show that the true action of the microphone is not due to this variation of surface contact, as Sir William Thomson and others have maintained, but rather to the sensitive electric discharge passing between the points. In fact, the voltaic arc of an electric lamp will speak, as we suggested in a recent note on the "flame microphone." The experiment has been made by Professor Blyth, who recently read a paper on the subject to the Royal Society of Edinburgh. Professor Blyth's experiments lead to the same result as those of Professor Hughes' and his colleagues; and as the latter are still unpublished, we can only refer to those of Professor Blyth. He finds that the action of the microphone cannot depend on variation of resistance due to pressure altering the specific resistance of the material, as such resistance is unaffected by considerable variation of pressure. He shows that the variation of resistance due to change of area of surface contact follows no regular or harmonic law, owing to the gritty nature of the carbon. Moreover, speech, properly directed on a small voltaic arc, is found to be transmitted; and here, of course, there is no contact. Mr. Blyth is of opinion that the effect is due to the sound waves directly acting on the small arc between the microphone points and the tremor set up in the points themselves by transmitted vibrations.—*Engineering.*

Pezzer's Accumulator.

This battery is constructed as follows: Narrow bands of lead, 10 to 15 millimeters broad and 500 in length, are obtained by cutting up sheets of a suitable thickness, and they are made to take a waved form by being passed between the rollers of a machine used for folding stuffs obliquely. Each of them is doubled in two, and they are placed in juxtaposition, fold upon fold. The free ends are then soldered together by the autogenous process, forming them into fringes. These fringes are introduced in place of the carbon and the zinc in a Bunsen element (Ruhmkorff's model), where some of them fill the porous vessel, and the others the interval between the porous vessel and the sides of the exterior vessel. The soldered ends are upward and the folds downward. Plates soldered to the upper part serve as electrodes.

An electric railway is to be made in the picturesque valley of the Bruhl, near Vienna. It will extend from the railway station of the sulphurous baths of Merdling to the hotel known as the Zwei Raben, near Meierei, in the Hinterbruhl, which is annually frequented by thousands of tourists. The length will be nearly two miles.

The new steamer Normandie, of the French line, will be lighted entirely with the electric light. The cabins will be very large and elegantly fitted up.

George A. Redman has resigned his position in the Western Union telegraph office at Rochester, N. Y. after being connected therewith for eighteen years His resignation went into effect on Saturday, and he is soon to take charge of the Brush Electric Light, now an assured success, and requiring only such ability and energy as Mr Redman will bring to the work of introduction and superintendence to greatly extend its use. The public generally will miss an old familiar face from his old post of duty, but his friends will not fail to extend to him in his new line all the encouragement and material assistance they may be able to render. He will, indeed, have the best wishes of the entire community in which he is so well known and which he has so faithfully served.—*Rochester Union.*

The Atlantic Telegraph.

At an anniversary banquet given by Mr. Cyrus Field in London, the Western Telegraph lines were brought into the room and messages interchanged with America, these messages were delivered at their respective addresses, and the replies to them were received back in the room in the following period: From the President at Washington, 2 hours 10 minutes; from Mr. Seward at Washington, 2 hours 22 minutes; from several persons in and near New York, average 1 hour and 45 minutes; from the Governor of Cuba, who apologized for the delay caused by his residing at a distance from Havana, 2 hours 24 minutes, from the Governor of Newfoundland at St. John's, 38 minutes; and from Heart's Content, Newfoundland, 6 minutes. But even these performances are thrown into the shade by an ordinary message sent from London to San Francisco on February 1st, 1868. The wires on this continent were joined up for experiment from Heart's Content to California, and the message was sent from Valentia at 7.21 A. M.; the acknowledgment of its receipt was received back in Valentia at 7.23, the whole operation having only occupied 2 minutes; the distance traveled was about 14,000 miles; and the message arrived, according to San Francisco time, at twenty minutes past 11 on the evening of January 31st, or the day preceding that on which it left England.

Reaction of Induced Currents.

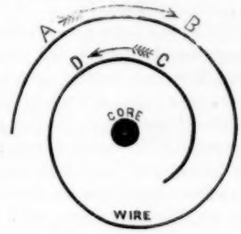
By F. W. Jones.

The detrimental effects of electro magnets in a telephone circuit, during conversation, have been well known for some time. They were first clearly pointed out by Professor Elisha Gray, in an article published in the *Journal of the American Electrical Society*, No. 3, vol. ii., 1878. On page 78, Professor Gray says: "It follows from the observations made above, in regard to the resistance to the passage of rapid vibrations through a helix having insulated in it an iron core, that any electro-magnet inserted in the circuit through which rapid electrical vibrations are transmitted, will either totally absorb them or greatly diminish their power. This is found to be true in practice, and it was a serious problem how to use successfully-speaking telephones upon lines where more than two stations were necessary."

To obviate this difficulty, Professor Gray applied a condenser around each electro magnet, and states that so effectual was the remedy that even five or six magnets may be placed in the circuit without diminishing the tone.

By the aid of the accompanying diagram it will be easy to comprehend the nature of the electrostatic reaction in the electro-magnets which so seriously impair the characteristics and distinctness of the voice during transmission.

The electrical waves representing the vibrations of the diaphragm, which was set in motion by the sound waves of the speaker, are shown as passing



around the convolutions of the electro-magnet in the direction of the arrow, *A B*, while in the adjacent convolutions an extra current of momentary duration is aroused. The latter is always opposite and antagonistic to the former. If the current between *A* and *B* is increasing, and flows in the direction of the arrow, a current of opposite direction is induced between *C* and *D*. Of course the core reacts to augment these effects. In ordinary circuits, where heavy dynamic currents are employed to actuate electro-magnets, the well-known effects of these extra currents are to delay the magnetization and demagnetization of the cores, and prevent a free and prompt action of armatures. This is all at the expense of so much of the original current. The effects of these induced currents in electro-magnets inserted in a telephone circuit are substantially the same, but more serious in their consequences, inasmuch as the electrical waves which are excited to reproduce the human voice are of infinitesimal quantity and minute amplitude, and many of the impulses representing overtones are undoubtedly extinguished in the magnets which may be correctly called *opaque* to rhythmic currents. Now, it seems clear that any device which will cheaply and effectually permit the passage of the voice waves through or by electro-magnets, is just as substantial an improvement as one that renders the telephone itself clearer and louder. This may not have any practical weight in the minds of those who operate short lengths of wire, including but two instruments, inasmuch as the electro-magnets will be out of circuit during conversation. On wires, however, where it is found economical or desirable to place several offices, it is not possible to avoid speaking through the electro-magnet of some of the signal bells.

Some time ago a device was patented by the writer, for the elimination of the difficulties just described its exceeding simplicity, and the very high testimonials it has received from gentlemen of unquestionable reputation, led me to bring its merits to the attention of your readers. The shunt, as it is styled, is a bobbin of insulated German-silver wire, so wound as to be perfectly free from self-induction and is intended ordinarily to form a branch circuit around the electro-magnets, thus providing a free path for telephonic currents. In a circuit embracing ten instruments, with 80 ohms in each signal magnet, the resistance of the circuit would be reduced 400 ohms, and the articulation will be rendered as perfect as is possible upon a clear wire, while the electric bells are left free to perform their office even more satisfactorily than without the shunt. It is not claimed that the "frying" from *Morse* wires will be decreased, but it is found that the improvement of the voice gives a decided advantage over outside disturbances.

The Western Electric Light Co.'s Poles Cut.

Newport, June 17.—Some time during last night several poles, which were erected on Bellevue avenue by the Western Electric Light Company of Boston, Mass., were cut down. It is believed that the other poles will be treated in the same way to-night.

The Principle of Carbon Telephones.

By Count Th. Du Moncel.

The lawsuits which have recently taken place in England, regarding the patents for telephones taken out by Messrs. Bell and Edison, now combined for mutual benefit, have led to several interesting discussions on the questions relating to the principles on which this apparatus is founded, and the result is, according to the last judgment pronounced, that the telephonic receivers based on the action of undulatory currents are Mr. Bell's property, but that the transmitters with variable solid resistance of the Edison type, are public property, and consequently that all the microphonic transmitters of carbon, coke-powder, &c., are not infringements.

It is certain that the principle on which the action of these instruments is based has long been known, for since 1856 I had made several experiments in order to demonstrate it, but according to the French law this priority would not have been sufficient to invalidate the Edison patent, for, by this law, the application of a known method to an apparatus producing a new effect can be patented. However, it would seem that, even from this point of view, Edison would not have the priority, for in 1876 (April 10), Mr. McDonough had, it is said, made a transmitter with variable resistance which, when applied to an electro-magnetic telephone, was capable of reproducing speech, and this system and that of Edison only differed in the material employed for the contacts. In the one, in fact, the contact is effected between a surface of carbon and a surface of platinum, whereas, in the other, it takes place between two pieces of metal with rough surfaces, placed one upon another, the widest of which is connected with a diaphragm stretched upon a drumhead. In the latter system, we can imagine that it is the rough surface which takes the place of the imperfect conductor represented in the other by the carbon.

It has been shown elsewhere that the presence of a diaphragm vibrating before the imperfect contact was not necessary for the transmission of speech, since this effect could be obtained by speaking over an agglomeration of fragments of carbon placed between two metallic electrodes. It should be remembered, in fact, that with a system of this kind, I was able to dispense with a battery by employing as electrodes zinc and copper plates, and by immersing in water these carbons and electrodes. All these systems are, in fact, derived from the principle which I discovered in 1856, and as, notwithstanding what has been said on the subject by competent men, my researches seem to have been forgotten, I think it advisable to refer briefly in this article, especially as in a report recently presented to the Society of Telegraph Engineers of London by Mr. Dolbear, we read the following remarks, which require some comment, on the subject of the interrupter of Reiss's telephonic transmitter:

"It is *denied* that, at the time when Reiss invented his transmitter, it was known that differences of pressure imparted to the contacts of an interrupter would produce differences in the intensity of the electric current passing through them. However, all that have employed voltaic batteries since they have been known, are aware that the first instructions given were to establish the communications well; and why? For this simple reason, that if these communications were not good, the maximum of current that they were capable of producing could not be obtained. Thus, good contacts were then known as good elements for an electric current, &c."

Mr. Dolbear must have forgotten the earlier construction of Reiss's apparatus, and lost sight of the principle of the telephonic transmitters with voltaic currents, when he wrote the above lines. Of course it was known before 1860 that contacts well established offered less resistance to the current than contacts badly made, but that was owing chiefly to the state of cleanliness of the surfaces of these contacts; the question of pressure did not enter into it, seeing that the difference which might result from this action with metallic contacts are only manifested in the case of extremely weak contacts.

Now, in the preparation of a battery, no one has ever had the idea of effecting the communications by the simple adherence of one conductor to the other; connecting screws or straps have always been used, and then a pressure, more or less, did not matter. But what was attempted above all was to well scrape the surfaces of contact, so as not to have a layer of oxide or greasy matter which might introduce into the circuit a useless resistance.

When, in 1856, I studied effects of this nature, I had not taken into account this layer of more or less resistance, since *I only used metals perfectly scraped and dried*, and what struck me was, that in the slight contacts resulting from the simple adherence of two pieces of metal placed one upon the other, the intensity of the current increased up to a certain limit with the pressure exercised on them. This is what made me write in vol. i. of the 2d edition of my "Exposé des Applications de l'Electricité," page 246 (published in 1856), the following remarks:

"A curious fact, and one which seems at first to be contradictory to the theory which has been formed of electricity is, that *the pressure, more or less, which is imparted between the contacts of the interrupters has considerable influence on the intensity of the currents which pass through them.* This is owing to the fact that the metals are not always in a perfect state of cleanliness at the point of contact, but, perhaps, also *to a physical cause not as yet well understood.*

It is certain that this observation was published before Reiss's experiments, but I doubt whether he took it into account in his musical telephone, for in this apparatus the two contacts of the interrupter, in order to produce an appreciable effect, should not be permanently touching. We know, in fact, that in order to cause sounds to be emitted in an iron wire coiled in a spiral, it was necessary, in the conditions in which Reiss was placed, that *the currents should be freely interrupted;* with mere undulatory currents transmitted by our most perfect microphones, articulate sounds can only be perceived in receivers of this kind by applying the receiver to the ear. Now, Reiss's apparatus had never been constructed for that. On the other hand, with metals, the extent of the variations of electric intensity with the differences of pressure is so limited that, even with very delicate receivers, the reproduction of speech would never have been effected in a satisfactory manner; it would have been necessary, therefore, to render the surfaces of contact rough, as Mr. McDonough has done, or to insert between the contact plates a drop of water, or a body of moderate conductivity, as Mr. Yeates had done. Even although Reiss had spoken of transmission of speech by his system, that would not prove much, for M. Bourseul had also claimed to have effected it in 1854 by similar methods, and these means were evidently insufficient.

Thus the fundamental principle of the speaking telephone, *i.e.*, the possibility of affecting a telephone receiver by undulatory currents, the function of the amplitudes of the sonorous vibrations, cannot be discovered in Reiss's telephone, which has, besides, never transmitted anything but musical melodies; and, whatever Mr. Dolbear may say, this system must be actuated by currents completely interrupted in order to work as Mr. Reiss intended, *i.e.*, so as to produce strong sounds, just as the singing condenser can only be heard at a distance under similar conditions.

We shall speak later on of the other methods of arrangement attributed to Reiss by Mr. Dolbear, but these have nothing to do with our subject at present.

At the time of my first experiments on imperfect contacts, I had tried, as interrupters, various conducting bodies beside metals, even carbons, and I thought I had discovered that *the differences of intensity increased with the resistance of the bodies in contact.* This fact was proved to me afterwards, when I noted the variations of resistance produced by powdered charcoal and coke, according to their degree of compression. However, not seeing at that time any particular advantage in this property, I gave it no further consideration, and only thought of utilizing the carbon interrupters to obtain undulatory currents capable of reducing the effects of extra currents. In the volume before quoted (vol. i., pp. 263, 264) I have described two systems of interrupters of this kind, one of which was designed by Pulvermacher. In 1872, when I commenced my studies of the conductivity of semi-conductors, I was led to measure the resistances of charcoal dust and metallic filings, and this is what I said in one of my notes inserted in *Comptes Rendus*, December 2, 1872:—

"The value of the resistance of the intermediate substance was, with the dry charcoal powder, from 1,200 to 2,000 kilometers of telegraphic wire, and with the metal filings or coke-powder from 1,200 to 2,000 meters according to the greater or less brilliancy of the surface of the metellic grains *and their degree of compression round the electrodes, &c.*" The effects of slight connection between the contacts of the interrupters had particularly struck me in 1864, when I experimented on M. Carlier's electro-magnets with naked wire. On coiling round a tube of glass, by the ordinary process, a spiral of copper wire unprovided with any insulating covering, I was surprised to find that my spiral offered, along one single row of spirals, almost as much resistance as a spiral of the same length of wire covered with silk, although my wire was perfectly clean. Thinking that this effect was attributable to an insufficiency of contact between the spirals, I wished to become sure, and therefore adjusted at the extremities of my tube two slips of wood, which I made to slide along it by means of a screw handle crossing the tube lengthways. In this way by making the slips approach one another, I was able to compress the spirals one against another in succession and thus increase their adherence. Under these conditions, the closer the contact between the coils, the more easily would the current passing through the spirals be derived from the metallic mass formed by the juxtaposition of these spirals, and consequently the resistance would be diminished in proportion to the tightness of the coiling.

This was verified by the experiment, and I could also see that the effect was all the more marked when the number of spirals or contacts was greater and when the wire was not so well cleaned. When the pressure was very slight, as in ordinary coils, the resistance of the wire was almost as great as if it had been covered with silk, but it grew less and less as the screws were tightened until the maximum pressure was attained. The reverse took place when the screws were loosened. I made this experiment in 1864, when I presented to the academy M. Carlier's electro-magnets, but, in 1865, I published a long article on the subject in the *Annales Telegraphiques* (vol. viii., p. 211, published March-April, 1865), from which I give the following extract:—

"With coils of 186 spirals, the scouring of the wire with emery paper only, made the insulation vary in the proportion of 1.06, to 1.35; but under other conditions, for example, *when the wire is coiled on a glass tube and the spirals pressed together closely, this proportion is infinitely greater.* However it may be, when the contact between the spirals becomes perfect, no magnetic effect is produced. Thus an amalgamated wire coiled in a spiral produces no attraction, and if we envelop with a covering of tinfoil the coil of an electro-magnet with a single row

of spirals, the attractive effects are considerably diminished.

"The result of all this is that the juxtaposition of the convolutions of a magnetic spiral *constitute an imperfect contact* which, as in the metallic filings, oppose to the propagation of electric currents a considerable resistance; but this resistance is not sufficient in itself to account for so complete an insulation of the spirals of the magnetizing coil as we have found to take place. The proof is that *the contact of these spirals is sufficient to preserve almost without loss of force the action of the current when the wire of the magnetizing coil has been cut at one or several points.*" M. Treve has demonstrated the variation of the intensity of a current in proportion to the pressure in a very interesting and unmistakable manner, by the following experiment:—

"It is known that if we break an electric current passing through an electro-magnet between its poles, we produce a rather loud noise capable of being heard in every part of a room. Now this noise can be rendered more or less intense according to the pressure exercised on the two conductors that are separated."

My researches on the effects produced by pressure have not been confined to metals and broken-up conducting substances; I have extended them to bodies of a woody nature; and this is what I said on the subject in a note presented to the Academy of Sciences at the sitting of July 6th, 1874:—

"The degree of pressure against the wood, of the plates of platinum serving as electrodes, so influenced the intensity of the current thus transmitted, that having amounted to 12 degrees with a maximum pressure, it fell to zero when the plate was left to its own weight, and to 5 degrees only with a slight pressure. We find from these first experiments that the relative conductivity of the wood is due in a great measure to the dampness absorbed through its pores, and that this conductivity is in proportion to the degree of pressure of the communicating plates. This last action then evidently depends *on the closeness of the contact* produced between the two adjoining surfaces, for by substituting a drop of distilled water for the pressure, we immediately obtain, with the plates simply laid upon the wood, the maximum of the deviation, just as if these plates had been pressed tightly down.

I describe still further experiments relating to these effects of pressure in several reports presented to the Academy at the sittings of August 10th, and September 7th, 1874, and May 2d, 1875. This resistance to the passage of the current of which I have just spoken, is not confined to electrical transmissions; it is also to be found in magnetic effects. Thus, if we divide a magnetic core into several parts, or if we form it of several plates of iron in juxtaposition, the attractive force which it will produce will be less energetic, but the inductive effects will be much more intense, on account of the greater rapidity of the magnetizations and demagnetizations. Now this effect will be about the same whether the plates are magnetically insulated from each other or not, if they are not too closely pressed together. This explains why it is not necessary in induction coils to insulate the different iron wires which compose the magnetic core. I have described these effects at some length in my "Exposé des Applications de l'Electricité" (vol. v., pp. 347, 348, 349).

The explanation of the increase in proportion to the pressure of the intensity of the currents transmitted through moderate contacts has been the subject of numerous researches made by Ochorowicz, Ferrini, Barrett, C. Cooke, Nosworthy, &c. I give the following extract from a work presented by me to the Academy of Sciences, July 29th, 1878 (p. 191):—

"I think that, up to the present, the physical effects produced at the points of contact of conductors traversed by a current have not been sufficiently taken into consideration. There is undoubtedly a resistance to the passage, which varies with the pressure exercised upon the surfaces in contact. Does this effect arise from the fact that, in consequence of this pressure, the surface of the contact is more developed by a partial flattening, equivalent to an increase of the section of the conductors? Or should it be attributed to the repulsions taking place between the contiguous elements of the same current, which being effected more easily with slight contacts than close ones, would tend to suppress them? All these ideas come into one's mind when the phenomenon is observed, but they require to be thought out, and I call the attention of experimentalists to the subject. It is always noticeable that the more considerable the resistances to the passage and the greater the number of contacts, the more marked are these effects."

In a communication addressed to the Royal Society of Dublin, February 17th, 1879, Professor Barrett attributes the effects in question to the contact more or less close between the molecules of the conducting substances placed face to face under the influence of pressures more or less powerful exercised upon them. He quoted in support of his opinion an experiment which we think worth describing, and which was recently published in the *Electrician* of May 6, 1882.

He places in the bell-shaped part of a long barometer siphon tube, open at both ends, a button of carbon prepared after Edison's method, and placed so as to form a stopper some millimetres below the orifice of this part of the tube; he pours over it a certain quantity of mercury, which he puts in electrical communication with an electric circuit into which a Wheatstone bridge is introduced, and he fills with the same liquid the lower part of the siphon until the mercury reaches the level of the under surface of the carbon stopper. Under these conditions, the carbon is situated between two electrodes of mercury in perfect contact with it, and no pressure is exercised upon its under surface; so that by putting the mercury into communication with the circuit of the measuring apparatus by the bent part of the tube, it becomes easy to measure the resistance of the carbon between the two electrodes without having to take into account the pressure exercised upon it. Now, if we pour into the long part of the tube different quantities of mercury of known weight, we can submit the carbon to different pressures easily calculated, without in any way altering the conditions of good contact, and we may observe, by the variations of resistance, the influence exercised on the intensity of the current through the system. Now, in the numerous experiments which he has undertaken with this apparatus, Mr. Barrett has found that between limits of pressure varying from two to thirty centimetres, the resistance of the carbon did not seem to alter appreciably. It kept at two ohms, and the variation scarcely reached the tenth of an ohm.

"We see, therefore," says Mr. Barrett, "that when very close contact is established between the two surfaces of a carbon, an increase of pressure causes no variation of resistance. Consequently, the pressure only acts in carbon telephones, as in microphones, by the greater or less number of points of close contact established between the two bodies placed face to face, which allow the current to pass through them more or less easily. If we use spongy platinum instead of carbon, the same effects are produced, and with this material we can even construct good telephone transmitters."

We agree to a certain extent with Mr. Barrett, and as has been said above, I had, as early as 1874, attributed the variations produced by pressure exercised upon imperfect contacts, chiefly to *closer contact* between the two surfaces; but, according to M. Ferrini, the effects are somewhat more complicated, for in the actions caused by pressure upon bodies of moderate conductivity, two effects are produced independently one of another, one which is momentary, and which disappears when the pressure is restored to its original force, the other, which is more or less lasting, and which is often observed after the original pressure is restored. This last effect augments with the increase of pressure, and tends to diminish the general resistance of the moderately conducting body. This last effect is no doubt attributable to a loss of elasticity in the conductor, which causes certain groups of molecules, after having been pressed together in consequence of the pressure brought to bear upon them, to take a certain time in regaining their original equilibrium. This effect is in no way contradictory to the explanation we have given, but, on the contrary, helps to support our opinions. The question is somewhat complicated, as M. Ochorowicz has shown, and, if our readers wish to study it in detail, we will refer them to his articles puplished in *La Lumière Electrique* of Octoberr 15, November 15, and December 1, 1879, and also to M. Ferrini's article, published in the same journal, on January 15, 1880.

Lately, in connection with the lawsuits which have taken place in England concerning the telephone, Mr. Conrad Cooke undertook several experiments in order to prove that the variations of resistance resulting from pressure are not produced under the same conditions with hard carbons as with soft ones. Thus, he shows that if a carbon pencil is placed between two blocks of the same material, and forms part of a telephonic circuit, no sound is obtained in the telephone when the upper block is struck with a hammer; but if the carbon interposed is of a soft or spongy nature, these blows of the hammer are heard perfectly in the telephone. He concludes from this that, in the first case, the variety of intensity in the current arise from a variation in the resistance in the surfaces of the carbon in contact, a variation which can only be verys light and in proportion to feeble pressures, whereas in the other case the variation results from a change of conductivity in the whole mass. This explanation does not in any way contradict the ideas we have expressed from the beginning.

This experiment of Mr. Conrad Cooke has, however, been contested by Mr. W. F. Nosworthy, who has heard, very clearly, blows struck upon coke carbon, with or without an induction coil in the circuit; but it was necessary that the telephone should not have a high resistance when no induction coil was used. In short, Mr. Nosworthy considers it beyond a doubt that the conductivity of carbon increases with the pressure, whatever may be its nature and its degree of hardness, this increase being capable of rising from 18 to 30 and even 40 per cent. to under high pressure. However, he thinks that the effects of pressure resulting from the sound waves on contact, of this nature, would be so slight as to be scarcely appreciable on the measuring apparatus with hard carbons; so that the variations of resistance under the influence of pressure would not in themselves be sufficient to explain the effects observed; we must, therefore, go back to the explanation I had given at first, taking into account the *closeness* of the contact and the size of the section of the conductor at that point. The experiments of Messrs. Barrett and Ochorowicz also seem to prove this. We refer those interested in this question to Mr. Nosworthy's article, published in the *Telegraphic Journal and Electrical Review*, of May 20, 1882.

In short, the effects produced by pressure on the conductivity of bodies are important phenomena which have, it is true, passed unnoticed until the time when I made my first researches, but which are not so simple as they seem to be thought by Mr. Dolbear and several *savants* who are contented with a first glance. Since 1865, M. Clerac, in France, and Mr. Elsasser, in Germany, have made important applications of them to instruments of variable resistance, and when Edison applied them to telephony, people who at first doubted their existence began to discover

them everywhere, even where they do not exist. Such a course, calculated to injure the credit of true discoverers, can only influence seriously those who do not understand the subject, but truth always declares itself at last.

Telegraphic and Telephonic Notes.

THE MUTUAL UNION.—The Mutual Union Telegraph Company, of New York, have executed a first mortgage of $5,000,000 to the Central Trust Company. The money is to be used in extending and completing the company's lines.

For the information of his many friends we will say that the Hon. W. R. Warren was, when last heard from, enjoying the sunny side of Italy. We hope that he will soon return to business improved in health, for he is one of the men of the times who cannot be spared conveniently.

The Council of the Society of Telegraph Engineers and of Electricians, London, have determined that the Society shall offer three premiums annually for the best original papers sent in to the Society on telegraphic or electrical subjects during the session by any person not being a member of the Council of the Society. The 1st premium will be called the Society's Premium, value £10; 2d, the Paris Electrical Exhibition Premium, value £5; 3d, the Fahie Premium, value £5. The Premiums will consist of books or scientific apparatus. The first premium will be awarded in 1883, for the best paper sent in between this date and the end of May next.

Telephone Litigation.

The London Globe Telephone Company have applied for an injunction to restrain the United Telephone Company from issuing damaging statements referring to the Hunnings transmitter. The case will come before Mr. Justice Fry in the Chancery Division.

The Telephone.

A regular telephone system has been arranged between Brussels Observatory and the Meteorological station at Ostend—about 78 miles—after highly successful experiments with the Rysselberghe improved telephone.

Direct United States Cable.

An extraordinary general meeting of shareholders was held on Thursday, May 25, at the City Terminus Hotel, Cannon street; Mr. J. Pender, M. P., in the chair.

The chairman explained that the meeting had been convened for the purpose of approving of an agreement made between the four Atlantic cable companies. The shilling rate which had been tried had not been successful, and, in fact, their traffic had rather decreased than increased under it. By the agreement, working arrangements were entered into with the Wertern Union Company, which had the control of a vast telegraph system, including the districts of North America and Canada. The importance of having an adequate and well-managed system of telegraphic communication could not be over-rated, and as an instance of the rapidity with which messages could be transmitted, he stated that the result of the Derby was known in New York thirty five seconds after the conclusion of the race. By the agreement, taken in connection with the existing agreements between the Direct United States Cable Company, the Anglo-American Telegraph Company, and La Compagnie Française du Télégraphe de Paris à New York, the joint receipts of the four cable companies would become divisible in the following proportions: From the date at which the American Telegraph and Cable Company shall have one cable in complete working order and condition, and regularly opened for traffic: 18.375 per cent. to the Direct Company, 55.125 per cent. to the Anglo Company, 14 000 per cent. to the French Company, and 22.500 per cent. to the American Company, and from the date at which the American Telegraph and Cable Company shall have two cables in good working order and condition, and regularly opened for traffic, the division of traffic receipts would be in the following proportions: 16 275 per cent. to the Direct Company, 48.825 per cent. to the Anglo Company, 12.400 per cent. to the French Company, and 22.500 per cent. to the American Company.

On the proposition of the chairman, the agreement was unanimously approved of.

The proceedings were brought to a close with the passing of a vote of thanks to the chairman.

The *Figaro* learns that Mr. Van Rysselberghe, who has found how to communicate at great distances telephonically on the ordinary telegraphic wires, is going to sell his discovery for $200,000 to the French Government. Mr. Cochery, the French Postmaster-General, is much impressed with its importance.

How Merit and Faithful Service has been Rewarded.

W. H. Huntington, the Assistant General Superintendent of the American District Telegraph Company of this city, began his remarkable career as a telegrapher at 11 years of age with the American Telegraph Co. as messenger, at Harlem, salary $8 per month, under the superintendency of J. C. Hinchman, from messenger to clerk, and, at 17 years of age, with the Franklin Co. as operator at Harlem, salary $28 per month. Again coming under the notice of Supt. Hinchman, was sent to Brewsters, N. Y.

He joined the ranks of the P. & A. Co., in Jersey City, and at the time of the purchase of that company by the Western Union, was offered a reduced salary by the latter company, or, in lieu of same, one month's salary in advance, and dismissal. He accepted the latter, and the following day opened in the same office for the A. and P. Co. Always successful, he attracted the notice of Mr. George F. Durant, then superintendent of the American District company, and was brought by that gentleman into that company, first as manager, and in six months had charge of five offices.

At the resignation of H. W. Pope, he was selected to fill his place, and succeeded to the entire satisfaction of the company; was, after the expiration of two months, appointed Assistant General Superintendent, Wm. F. Chester having been engaged to fill the position of General Superintendent.

Mr. Huntington has recently resigned the above position to accept an appointment as General Superintendent of the Puebla Telephone Company at Pueblo, Mexico, where he goes to take charge of the construction and operating of their exchanges at an early day.

Telephone Facts and Figures.

The amount of Lowell money invested in the telephone business, particularly that which is centered in this city, is such as to make the following of general local interest The monthly reports are now made up, and show a net gain of subscribers during May to the National Bell Company, Maine, of 78, as follows: Lowell 22, Worcester 13, Fitchburg 8, Portland 15, Lewiston 10, Bangor 8, Calais 1, Bath 1, making a total of 3,392 subscribers. The Boston & Northern Company added in May a net gain of 99, as follows: Exeter, Portsmouth and Dover divisions 31, Salem and Lynn 45, Lawrence and Haverhill 17, Newburyport 2, Nashua 4, making the total now connected 1,706. To give an idea of the work performed between cities it may be a matter of interest to know that the number of communications over the Boston & Northern Company's extra territorial lines during the month was 8,883. The net earnings of the National Bell of Maine for May were $6,300, and of the Boston and Northern Company for the same period $3,863.

Some two years ago, Edgar G. Stevens, chief operator, General Telegraph Office, N. Y., P. & O. R. R., Cleveland, conceived the idea of overcoming the difficulty often experienced by all telegraphers, especially on railway lines, to distinguish "L" and O or cipher from each other, both being identical in the Morse telegraph alphabet, now universally used in this country. To accomplish this, he introduced the character . . — —, two dots and two dashes to indicate a cipher, instead of the Morse long dash. The "Stephens cipher" has been accepted by all the operators of the above lines as a great improvement, and has been in constant use on their lines for the past year; also some of the neighboring lines. Way bills, baggage checks and tickets are often numbered with an "O" or "L" preceding, always requiring an operator to break and ask whether it is an "O" or "L," unless the sender explains which is i tended when the long dash is made. This impor ant improvement, we understand, is now in the hands of the executive commi.tee of the Western Union Telegraph Company under consideration, which, we trust, will result in its adoption.

The Vienna Chess Tou nament.

VIENNA, June 18.—The chess tournament here will probably terminate on Wednesday next. The contest is the closest on record. Mason, by beating Winawer and Hauby, and drawing against Blackburne and Zuckertort, took the lead, but failed to maintain it. His game with Winawer was the most brilliant of the tournament. Mackenzie's play has been of the highest order; he now tries for the first place. The scores of the leading competitors, after thirty one rounds, now stands: Mackenzie, Steinitz and Winawer, 21½ each; Mason, 21; Zuckertort, 20½; Blackburne, 18½; Ware, 10.

Co t of one horse power per hour, as follows, from experiments lately made at Carlsruhe.

100	H. P.	steam engine	1.90
2	"	"	11.07
2	"	Lehman caloric engine	6.62
2	"	Hock motor	2.00
2	"	Otto gas engine	6.52
2	"	Otto-Langen gas engine	6 52
2	"	Schmidt water engine (fed by city water supply)	23.75
		Horses	11.10
		Men	50.00

INTERESTING TO TELEPHONE INFRINGERS.—The National Telephone Company's law agents in Scotland have issued a circular to infringers of the Bell and Edison patents, stating that no claim for damages will be made against them, provided they give up the instruments and the name and address of the person from whom they were purchased.

C. H. Sewall, formerly Inspector Second Division, American District Telegraph Co., resigned June 14th, to take position as General Agent of the Electric Signal and Time Register Co.

Telegraphic and Telephonic Notes.

Prior to the departure of Mr. G. S. Wiley for Mexico, as Vice-President and General Manager of the Central Telephone Company of Mexico, the employes of the Metropolitan Telegraph and Telephone Company assembled at his office to say good-bye, and, as an evidence of their good will towards their former General Superintendent, presented to him an elegant gold watch and chain, and also a purse containing a handsome sum in gold.

The presentation speeches were made by Mr. C. E. Chinnock, an electrician of the Metropolitan Company, and Mr. John Hemmens, who, in a few well-chosen remarks, expressed to Mr. Wiley the regret of the employes of the company in parting with one whom they had found so universally kind and considerate

Mr. Wiley expressed his regret at severing his connection with those with whom he had been so pleasantly associated for so long a time, and a suitable reply to Mr. Chinnock.

It is seldom that in an affair of this kind so much genuine feeling and regret is noticed.

EPERNAY, FRANCE, June 13, 1882.

Editor Telegraph and Telephone:

DEAR SIR—I am at Epernay since two weeks putting up telephones for the great champagne house of Moet & Chandon. This house has some 22 miles of wine cellars and fills yearly about 4,500,000 to 5,000,000 bottles of champagne. They have at present about 40 miles of cables and wires in their establishments and eleven sets of telephones.

A French chemist is said to have discovered that if a current of electricity of moderate intensity is made to pass for several days in a cask of bad wine, it modifies the liquid in an astonishing manner, it becomes good and has acquired an old taste. He explains that the current decomposes the water of the wine, the hydrogen is freed in a gaseous state, but the oxygen burns and neutralizes the pigments imparting the bad quality and taste to the wine.

It has been published in several electrical papers that a certain Belgian gentleman, Mr Von Rysdelberghem, had invented an apparatus which could permit the use of a wire for telephonic and telegraphic purposes at the same time; in other words, that a telegram and a conversation could be interchanged on one wire at the same moment The French Government was said to have bought the patent for France for 1,000,000 francs. This piece of news is entirely false, and the Government denies having made any such purchase, and the value is still undetermined

I deem it advisable to send you another article on the de Kabath accumulators. My first gave you their construction, my next will give you their theory and their action. I have two of these batteries to work upon, and next week I experiment them with a new microphone between Nancy and Paris (353 kilometers).

I have tried to explain why induction is considerably reduced when the primary circuit of a microphone not in use is open. That is to say:

If a person listening induction in a telephone, with a microphone attached, opens the primary circuit of the latter, he will immediately notice that the induction heard in the receiver is notably subdued, the battery plays no part in this action, as the closing or opening of the primary circuit can be made, and same effects produced without a battery.

I explain it thus:

When the primary circuit of the induction coil of a microphone is closed, any induction on the line is re-induced in said circuit, which in turn enforces the original induction current coming from the line; the listener hears therefore a sort of double induction, or rather the original one re-inforced. When the primary circuit is open he only hears the induction on the line in its true force.

I have not seen this fact and explanation anywhere, and cannot say if I am the first to give this idea.

A push button can be made to open the primary circuit when a person hears and does not talk, so that when he talks he presses the button, or *vice versa*, to close or open the circuit.

Yours very truly,

GEO. P. GRIGNARD.

Both sexes of the scholars of the Communal Schools of Paris are henceforward to be instructed in the use and practice of the telegraph system.

Miscellaneous Notes and Facts.

Fast Steamboat Time.

On Thursday, May 25, the Mary Powell made a trip up the Hudson River from New York to Rondout, 90 miles, in 4 hours and 17 minutes, beating her best previous time by 10 minutes. This is at the rate of 22⅕ miles an hour, and included the time taken in making eight landings.

A New Photo-Electric Cell.

A new cell giving a current when exposed to the action of light has been discovered by M. Saur. It consists of a square glass vessel, in which is placed a solution of fifteen parts of sea-salt and seven parts of sulphate of copper dissolved in 100 parts of water. A porous vase filled with mercury is placed in the solution. An electrode of platinum is placed in the mercury, and one of sulphide of silver is placed in the copper solution. These are connected through a galvanometer, and the cell placed in a dark box. The closure of the circuit throws the needle to the side indicating that sulphide of silver is the negative pole, and when the needle has gone to rest, if sunlight be allowed to fall on the cell, this deflection will be increased. On shutting off the light again the needle will fall to its old position, and if a cloud should pass before the sun while the cell is exposed to the light, the needle will show corresponding variations of current strength The action of the cell is that the bichloride of copper formed by the mixture of marine salt and sulphate of copper attacks the mercury. The photochloride of copper formed reduces the sulphide of silver, but this reduction requires the action of the solar rays, hence the photo electric current.

An Electric Lamp Story.

An old couple went to the Crystal Palace, were charmed with the electric incandescent lights, and asked the price, and found it moderate, the Swan lamps only costing 5s. each. Their means were limited, but the advantages seemed great, and they resolved to risk it, and invested in three or four Swan lamps. "Of course," said the intelligent clerk, who handed them the Swan circulars, "you know all about the engines and the different systems of producing electricity?" "Jist like these fellers, my dear," said the cautious old gentleman *sotto voce*, nudging his wife. "Come along, Maria." He thought he was going to be wheedled into buying a lot more things by a pushing young tradesman, and so the two hurried off. They got home, and, taking a box of lucifers, applied match after match to the "filament," after removing the globe (a vacuum) with some difficulty. Still the thing would not light At last, enraged, they appealed to the firm, and were—too late!—initiated one step further into the mysteries of electric lighting, which certainly seemed to them to be a case of "*locus à non lucendo*."—*London Truth*.

The Professor and the Inventor.

FROM *Quiz*.

The following is a good story about a well-known professor, which may go to prove that even great physicists are liable to error: The professor was showing a party of ladies and gentlemen over some large works at Birmingham, chiefly engaged in the manufacture of complicated optical instrument. The party came across a very ingenious instruments. The working of which the professor proceeded to explain. In the midst of his exposition, a roughly dressed young man, standing near, struck in, and civilly pointed out that the man of science was quite mistaken in his notions as to the instrument in point.

The professor, whose weak point is not an excess of humility, angrily maintained his own view, but did not succeed in convincing his opponent, who finally shrugged his shoulders and walked off.

"Who is that—that *person?*" asked the professor, indignantly, of a workman standing by.

"Oh! that is Dr. ——" was the reply; "he invented that instrument you have been looking at!" —Tableau!

Spanish Silver by the Gallon.

(From the New Orleans *Times-Democrat.*)

OPELOUSAS, LA., June 14.—Last Saturday, while a colored man by the name of Lewis Lowry was plowing in his field, about six miles east of Opelousas, his plow struck on some obstruction, which, upon examination, proved to be a ten-gallon jar filled with Spanish silver coins of the date of 1779, and bearing the imprint of Charles III. of Spain. The amount found is estimated at $8,000 or $10,000. One of the coins, a dollar piece, was brought to town to-day, and from all appearances had not circulated long, it appearing almost like a new piece. It is said by those who saw the money that all of it was of this description, and none of it less than 100 years old.

The East River Bridge.

The Special Committee of the East River Bridge Trustees, consisting of Mayor Low, Mayor Grace and Comptrollers Semler and Campbell, met on Wednesday morning in the bridge office, on Water street, Brooklyn, to hear what Col. Wm. Sellers, president of the Edgemoor Iron Company had to say about the non-delivery of steel to complete the East River Bridge. President Henry C. Murphy was also present. Colonel Sellers said that the steel would be delivered by October 31, and it was stated by the committee that if the steel was delivered by that date, the East River Bridge would be completed by March next.

The Submarine Cable.

A deadly enemy to the cable, in the shape of a large boring worm, exists in the Indian seas. The worm is flesh colored and slender, of a length from 1½ inches to 2½ inches. The head is provided with two cutting tools, of a curving shape, and it speedily eats its way through the hemp of the sheathing, to the gutta percha of the core, into which it bores a hole. A full account of this particular worm, with anatomical illustrations, is given in the *Journal* of the Royal Microscopical Society for October, 1881, by Dr Charles Stewart, secretary of the society. The bore-holes, after passing through the oakum of the inner sheathing, either pursue a tortuous course along the surface of the gutta percha core, or go right into the copper wire, thereby causing a "dead earth" fault. Dr. Stewart classes the worm as one of the Eunicidæ, but proposes for it the generic name of *Lithognatha worslei*, because of its possessing a pair of calcareous mandibles or cutting jaws, and after Captain Worsley, the commander of the repairing

ship which picked up the worm-eaten cable. The pair of calcareous jaws, in addition to the three pairs of chitinous ones, is the most remarkable feature about the animal, and the white plates which form them make the creature look as if it were in the act of swallowing a tiny bivalve shell. The best protection hitherto formed against it is to cover the core with a ribbon of sheet brass, laid on without a lap. First the gutta percha is covered with cloth, then the brass is overlaid. Canvas is then put over the brass, and the hemp and iron wires over all. A close layer of iron wires is not a sufficient protection, for the worm can sometimes wriggle in between the wires where they are not close enough; and, moreover, the rapid decay of iron wires in tropical seas is certain to leave the core a prey to these pests in a few years. * * * In the earlier days of submarine telegraphy, Sir William Thomson declared the life of a cable to be practically inviolable, and Robert Stephenson, on the other hand, was of opinion that no cable would last out ten years. The latter view has proved the most correct, for the average life of a cable hitherto has been about eleven years. Thanks to the improved means of repairing them, however, the outbreak of faults does not mean the loss of a cable, for these flaws can be cut out in water, however deep, and the cable put to rights again. Indeed, every cable company expects a recurrence of faults, and provides a fully-equipped repairing ship always on the spot.—*Nature.*

Sewer Gas in Houses.

Professor Kerr, in a late address before the British Civil and Mechanical Engineers' Society, expressed views on the sewer-gas question very similar to those urged by Drs. Hamilton and Doremus, of this city, in the discussion of the same question here last March. They knew, said Professor Kerr, that gas was generated by the decomposition of the decaying matter in sewage when deposited, in however slight a degree, upon any interior surface. What followed? They knew this gas had two qualities which were extremely obnoxious; one quality was that it ascended to the highest level by reason of deficient specific gravity; and the second quality was that when it reached the highest level it exercised a pressure, being an extremely elastic gas. He need scarcely point out the effect of these two considerations. When the sewer gas (a most excellent name, without going into particulars as to whether it should be called gas or vapor; the name sewer gas carried an idea of offensiveness which was extremely convenient)—when the sewer gas had reached the highest level, it exercised a powerful elastic pressure to force its way out, and succeeded in forcing its way. It got into the house; and if there were no other grievance, there was this to complain of—that this pestiferous and poisonous gas forced its way from the sewers into our houses, and of course reached the vital organs of those who occupied it.

The Electric Conductivity of Sulphur Plus Carbon.

At a meeting of the Physical Society, of London, a few weeks ago, Mr. Shellford Bidwell, the well-known inventor of the telephotograph, read a paper—which the demands upon our space have prevented us from noticing earlier—on the variation of the electric resistance of sulphur mixed with carbon when exposed to light. The material was prepared by taking twenty parts by weight of sulphur and fusing it at 158°, the melting point then mixing with nine parts by weight of powdered graphite. The mass was then poured into moulds and allowed to harden into rods and plates, which were then tested for their electric resistance by inserting wire into the mass. The influence of light on the resistance was tried by exposing the plates to a gas flame a few inches from them. In every case a rise in resistance was observed on exposure to the flame, but this was found to be due not to the action of light, as in the case of selenium cells, but to that of heat. As the resistance of carbon by itself and sulphur by itself diminishes under heating, the opposite effect of the mixture is somewhat anomalous. Mr. Bidwell explains it by supposing that there is no real union between the sulphur and the carbon, and that the particles of carbon fill up the interstices between the crystals of sulphur. These crystals expand with the rise of temperature, and thereby push the carbon particles apart. The latter, being the conducting part of the mixture, oppose more resistance to the passage of the current when they are pressed further apart. The resistance, as pointed out by Dr. Hopkinson, appears to increase in geometrical ratio, while the temperature increases in arithmetical ratio: at 14° Cent. the resistance of a bar of the mixture was 9,100 ohms, while at 55° it rose to 57,000 ohms, or over six times greater for a rise of temperature under four times greater. Resistance boxes of sulphur and graphite bars have been suggested, but Mr. Bidwell is of opinion that this sensitiveness of the material to changes of temperature is greatly against their use. Indeed, it fits the compound for use as a thermoscope when in circuit with a battery and reflecting galvanometer after the manner of a thermo-pile. Mr. Bidwell has also employed it as a telephone transmitter, by using it instead of selenium in the construction of a mica cell. These cells are made by taking a small, thin plate of mica, say 2 in. long by 1¼ in. wide, and nicking out the edges so that two fine platinum wires can be wound round the plate side by side, and two or three millimetres apart. The spaces between these parallel wires are then filled in with the melted mixture of sulphur and graphite thinlys pread and the layer allowed to cool. Using the two platinum wires as electrodes, and connecting the cell in circuit with a battery and telephone, words spoken against the mica plate will be heard in the telephone. —*Ex.*

War Handkerchiefs.

The ancient custom of illustrating pocket handkerchiefs for the amusement and instruction of children has been seriously emulated by the French War Office for the benefit of the national army. The cotton handkerchiefs provided for the French soldiers are now decorated with special texts and cuts for the technical and sanitary instruction of the wearers. The center is occupied with the Cross of the Legion of Honor upon a red background, and the inscription underneath it, *Honneur et Patrie.* Around this central point are grouped a circle of medallions, containing representations of officers of all grades, from the modest sub-lieutenant to the proud commandant of a *corps d'armee.* The different uniforms are pictured so distinctly that the French private can tell at a glance to what grade any officer whom he sees may have attained. The special pocket handkerchief prepared for the infantry soldier has exact drawings of the arms used by him, with explanations of their mechanism. The borders of the handkerchiefs are hemmed in with a framework of the national colors, and within this framework are printed a number of sanitary precepts to be observed on march and during a campaign. Here are some of the marching advices: "Wear the cravat loose. A strip of flannel day and night around the body in order to keep off the diarrhea. Quench thirst with very small doses of wine, coffee, vinegar and water, or brandy and water. Take a piece of bread and a little coffee before the march. Spirituous drinks do more harm than good. Drink water neither hastily nor too cold."

Chemical Equivalent of Carbon.

Recent experiments of Dr. Roscoe on Cape diamonds have a scientific interest, says *Engineering*, in connection with the equivalent of carbon. Following the method adopted by Dumas, the eminent French chemist, in 1840, he burned Cape diamonds in oxygen, and found that they contain no trace of hydrogen. They include, however, some traces of a non-combustible ash. Apart from this the diamond appears to be pure carbon. The results of six experiments made by Professor Roscoe are identical with those obtained by M. Dumas from Brazil diamonds. He finds that if the equivalent of oxygen is represented by 15.96, carbon becomes 11.07; and M. Dumas points out that if the equivalent of oxygen is roundly taken at 16, that of carbon becomes 12.002.

General Fitzhugh Lee wrote from Richmond to the Committee on Invitations: "Greatly preferring the society of the 'Society of the Army of the Potomac' in 1882 to the society of the 'Army of the Potomac' from 1861 to 1865, I regret that it will not be in my power to be present at their reunion in Detroit on the 14th and 15th instant."

Nature is always providing her compensations. Just as beef is so high that Barnum's giant, Captain Bates, can hardly reach it, a bed of hard clams has been discovered in Long Island Sound. As if Providence meant to signify that this was to make up for the scarcity of beef, the clams are deposited in Cow Bay.—*Detroit Free Press.*

The total length of fencing in the United States is upward of six million miles, and the cost over $2,000,000,000. This, the *Christian Register* says, does not include theological fences, which are much more expensive.

A brilliant row at Newport is that concerning the electric light, and some of the summer residents there appear to have jumped into it with more haste than discretion. The end of it may be in a blaze of electricity.

No less than fifty electric lights are used in and about the Long Beach Hotel, and at night one moves about in a moonlight atmosphere. Long Beach is going to make a great effort this year to come to the front among seaside resorts.

Users of the poisonous cigarette who are fools are being killed off by that villainous roll, and those who are not are learning the peril of the practice of smoking it. The Philadelphia *Times* says that the cigarette stamp tax in that city fell from $701.75 during the first five months of 1881 to $588.63 during the first five months of 1882.

The deepest mine in the world, according to Prof. H. Hoefer, of the Académie Impériale des Mines, is the Pirizbram silver mine, in Bohemia. The lowest depth is nearly 3,300 feet below the surface. At this depth the temperature of the rocks is only 75.90° F., and the temperature of the air 76.3° F.

Baker's Ocean Courier.

One of these ingenious contrivances for conveying records of events on the open sea, which was thrown overboard by the Swedish steamer Bele on her voyage from London to Gothenburg at noon, 6th ult., was picked up by the Emmerley in the district of Sleswig on the 10th ult., at 10 A. M.

NEW PATENTS—ELECTRICAL—1882.

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING MAY 30TH, 1882.

258,825. Circuit-Closer for Telegraph Keys. John A. Timmerman, Odessa, Ontario, Canada. Filed Mar. 13, 1882. (No model.)

258,636. Duplex Telegraph. Joseph E. Fenn, Elizabeth, N. J. Filed Jan. 5, 1882. (No model.)

258,648. Dynamo-Electric Machine. Edwin J. Houston, Philadelphia, Pa., assignor to the American Electric Company, New Britain, Conn. Filed Oct. 21, 1981. (No model.)

258 649. Dynamo-Electric Machine. Edwin J. Houston, Philadelphia, Pa., assignor to the American Electric Company, New Britain, Conn. Filed Dec. 10, 1881. (No model.)

258,864. Dynamo-Electric Machine. Hans J. Muller, New York, N. Y., assignor of one-fourth to Alexander Levett, same place. Filed Oct. 13, 1879. Patented in England April 25, 1881, No. 1,787; in France, April 26, 1881, No. 142,526; in Belgium April 28, 1881, No. 54,504; in Canada May 31, 1881, No. 12,888; in Spain July 21, 1881, No. 1,539, and in Austria July 22, 1881, No. 14,283.

258,800. Dynamo-Electric Machine. William S. Parker, New York, N. Y. Filed Mar. 4, 1882. (No model.)

258,546. Electric Incandescent Lamp. Emile Berliner, Boston, Mass. Filed Mar. 31, 1882. (No model.)

258,561. Electric Switch Board and Plug. Duncan Dewar, Indianapolis, Ind. Filed Oct. 3, 1881. (No model.)

258,581. Electric Arc Lamp. Charles A. Hussey, New York, N. Y., assignor to the Hussey Electric Company, same place. Filed May 25, 1881. (No model.)

258,600. Electric Railway Signal. Theodore A. B. Putnam, New York, N. Y., assignor, by mesne assignments, to the Railway Cab Electric Signal Company, same place. Filed June 25, 1881. (No model.)

258,601. Electric Safety Appliance for Railway-Switches, etc. Theodore A. B. Putnam, New York, N. Y., assignor, by mesne assignments, to the Railway Cab Electric Signal Company, same place. Filed June 17, 1881. (No model.)

258,603. Electric Time Detector. James E. Richards, Cedar Keys, Fla. Filed Oct. 20, 1881. (No model.)

258,625. Electric Individual Signaling Apparatus. Charles E. Buell, New Haven, Conn., assignor, by mesne assignments, to the United States Telephone Manufacturing Company, New York, N. Y. Filed July 6, 1881. (No model.)

258,627. Electric Individual Signal Apparatus. Charles E Buell, New Haven, Conn., assignor, by mesne assignments, to the United States Telephone Manufacturing Company, New York, N. Y. Filed July 6, 1881. (No model.)

258,684. Electric Arc Lamp. Elihu Thomson, New Britain, Conn., assignor to the American Electric Company, same place Filed July 11, 1881. (No model.)

258,747. Electric Incandescent Lamp. John H. Guest, Brooklyn, N. Y. Filed Dec. 23, 1881. (No model.)

258,795. Glass Globe for Electric and other Lights. John D. Muller, New York, N. Y. Filed Oct. 20, 1881. (No model.)

258,805. Electric Arc Lamp. Robert J. Pratt, Troy, N. Y. Filed Feb. 23, 1882. (No model.)

258,818. Electric Motor for Clocks. Louis H. Spellier, Doylestown, Pa. Filed Dec. 17, 1881. (No model.)

258,859. Electrical Connection for Railway Trains. Jesse B. Low, Pulaski, N. Y., assignor of one-half to Frank S. Low, same place. Filed Mar. 1, 1882. (No model.)

258,857. Galvanic Battery. Francis M. Kidder, New York, and Emerson W. Keyes, Brooklyn, N. Y., Administrators of Jerome Kidder, deceased. Filed Mar. 4, 1882. (No model.)

258,549. Insulating Material for Electrical Conductors. Francois Borel, Cortaillod, Switzerland, assignor to the Societe Anonyme de Cables Electriques, (Systeme Berthoud, Borel and Cie.), Paris, France. Filed April 15, 1882. (No specimens.) Patented in France Mar. 4, 1882, in Germany March 15, 1882, and in England Mar. 29, 1882.

258,626. Individual Signalling Apparatus for Telephone Systems. Charles E. Buell, New Haven, Conn., assignor, by mesne assignments, to the United States Telephone Manufacturing Company, New York, N. Y. Filed July 6, 1881. (No model.)

258,742. Magneto Generator for Railroad Signals. Wesley Ward Gary, Boston, Mass. Filed Jan. 5, 1882. (No model.)

258,681. Signalling Apparatus for Telephone Exchanges. James G. Smith, Hackensack, N. J. Filed March 28. 1882. (No model.)

258,868. Telephone Exchange Switch-Board. Chas. W. Ross and Geo. H. Twiss, Columbus, Ohio, assignors to the Western Electric Manufacturing Company, Chicago, Ill. Filed March 20, 1882. (No model.)

258,757. Telephone Transmitter. George M. Hopkins, Brooklyn, N. Y. Filed March 30, 1882. (N. model.)

REISSUE.

10,123. Underground Telegraph Line. David Brooks, Philadelphia, Pa. Filed April 20, 1882. Original No. 254,268, dated Feb 28, 1882.

FOR WEEK ENDING JUNE 10, 1882.

258,989. Attachment for Telephones. Josephus C. Chambers, Cincinnati, Ohio. Filed August 25, 1881. (Model.)

259,226. Automatic Telegraph. Gerrit Smith, Astoria, N. Y., assignor to the American Rapid Telegraph Company, Boston, Mass. Filed Nov. 8, 1881. (No model.)

258,942. Carbon for Incandescent Lamps. Joseph V. Nichols, Brooklyn, assignor to the United States Electric Lighting Company, New York, N. Y. Filed Feb. 1, 1882. (No model.)

258,957. Duplex Telegraph. Benjamin Thompson and Charles Selden, Toledo, O. Filed July 10, 1879.

259,061. Dynamo-Electric Machine. Charles J. Van Depoele, Chicago, Ill. Filed Dec. 15, 1881. (No model.)

259,106. Duplex Telegraph. Benjamin F. Dillon, Savannah, and John W. Brown, Augusta, Ga. Filed August 22, 1881. (No model.)

259,077. Dynamo-Electric Machine. Charles E. Ball, Philadelphia. Pa. Filed Feb. 25, 1882. (No model.)

258,871. Electro-Magnetic Action for Musical Instruments. Cyrus N. Andrews, San Francisco, Cal. Filed Nov. 19, 1881. (No model.)

258,903. Electric Incandescent Lamp. Moses G. Farmer, Newport, R. I., assignor to the United States Electric Lighting Company, New York, N. Y. Filed May 27, 1881. (No model.)

258,934. Electrical Signaling Circuit. Thomas D. Lockwood, Malden, Mass. Filed April 12, 1882. No model.

258,976. Electric Incandescent Lamp. Alex. Bernstein, New York, N. Y. Filed Dec. 24, 1881. No model.

258,964. Electric Lamp. Edward Weston, Newark, N. J., assignor to the United States Electric Lighting Company, New York, N. Y. Filed Dec. 23, 1881. (No model.)

258,965. Electric Lamp Bracket. Edward Weston, Newark, N. J., assignor to the United States Electric Lighting Company, New York, N. Y. Filed Dec. 13, 1881. (No model.)

259,007. Electric Arc Lamp. John H. Guest, Brooklyn, N, Y. Filed March 20, 1882. (No model.)

259,017. Electric Incandescent Lamp. Edwin J. Houston, Philadelphia, Pa., assignor to the American Electric Company, New Britain, Conn. Filed March 14, 1882. (No model.)

259,062. Electric Lamp. Charles J. Van Depoele, Chicago, Ill. Filed Feb. 11, 1882. (No model.)

259,066. Electric Spring Clock. Walter D. Whalen, Howell, Mich. Filed Dec. 1, 1881. (No model.)

259,186. Electric Push Button. George C. Maxwell, Washington, D. C. Filed April 8, 1882. (No model.)

259,223. Electric Lamp. Henry B. Sheridan, Cleveland, Ohio. Filed Jan. 10, 1882. (No model.)

259,224. Electric Lamp. Henry B. Sheridan, Cleveland, Ohio, assignor to the Sheridan Electric Light Company, New York, N. Y. Filed Jan. 26, 1882. (No model.)

259,235. Electrical Fixture. Luther Stieringer, New York, N. Y., assignor of two-thirds to Charles F. Hannington, same place, and Richard N. Dyer, Menlo Park, N. J. Filed March 15, 1882. (No model.)

259,267. Electric Device for Turning on, Lighting and Extinguishing Gas Jets. A. Livingston Bogart, Jamaica, N. Y., assignor to Abraham L. Bogart, same place. Filed Jan. 24, 1882. (No model.)

258,991. Electric Lamp. Charles A. Cheever, New York, N. Y. Filed March 28, 1882. (No model.)

258,943. Incandescent Lamp. Joseph V. Nichols, Brooklyn, assignor to the United States Electric Lighting Company, New York, N. Y. Filed Sept. 7, 1881, (No model.)

258,966. Incandescent Lamp. Edward Weston, Newark, N. J., assignor to the United States Electric Lighting Company, New York, N. Y. Filed July 12, 1881. (No model.)

258,931. Plug for Electrical Switch Boards. Harry W. Leland, South Framingham, assignor to himself and Joel C. Clark, Framingham, Mass. Filed Jan. 3. 1882. (No model.)

258,894. Telephonic Switch Apparatus. Henry W. Cozzens, Newport, R. I., assignor to the American Bell Telephone Company, Boston, Mass. Filed Oct. 16, 1880. (No model.)

258,886. Telephone Central Office Switch. Martin J. Carney, Toledo, Ohio, assignor of one-half to John M. Wheeler, same place. Filed Oct. 14, 1881. (No model.)

258,891. Telephone. James W. Clark, Etna, Ohio. Filed Feb. 13, 1882. (No model.)

259,057. Telegraphic Receiving Instrument. Gerritt Smith, Astoria, N. Y. Filed Jan. 4, 1882. (No model.)

259,225. Telegraphic Receiving Instrument. Gerritt Smith. Astoria, N. Y. Filed Feb. 20, 1882. (No model.)

259,046. Underground Electrical Conductor. Geo. Richardson, Philadelphia, Pa. Filed April 11, 1882. (No model.)

259,045. Underground Conduit for Electric Conductors. George Richardson, Philadelphia, Pa. Filed April 7, 1882. (No model.)

259,044. Underground Electric Conductor. George Richardson, Philadelphia, Pa. Filed April 5, 1882. (No model.)

259,130. Underground Conduit for Electric Wires. Christian H. Goebel, Philadelphia, Pa., assignor of one-half to George W. Bratton, same place. Filed March 7, 1882. (No model.)

A printed copy of the specification and drawing of any patent published herein, also of any patent issued since 1865, will be furnished by any of the patent solicitors whose advertisements appear in this journal. In ordering please state the number and date of the patent desired.

BANNING & BANNING,

PATENT ATTORNEYS

AND

SOLICITORS,

21 Park Row, NEW YORK. Honore Building, CHICAGO.

THOMAS D. STETSON,

Solicitor of American & Foreign Patents and Expert in Patent Cases.

Trade-Marks and Labels Registered.

23 MURRAY STREET, NEW YORK.

ESTABLISHED 1855.

PATENTS.

ELECTRICITY a specialty.

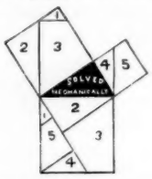
Patents procured for inventors in the United States and Foreign Countries. Send for circular.

A. M. PIERCE,

Office, 82 Astor House, New York City.

ELIOT & ELIOT,

SOLICITORS OF PATENTS,



AMERICAN AND FOREIGN

BOUGHT AND SOLD.

PATENT LAW

A Specialty.

40 & 41 Astor House, New York.

CONNOLLY BROS. & McTIGHE,

PATENT ATTORNEYS

AND

SOLICITORS.

Electrical Cases a Specialty.

91 GRANT ST., PITTSBURGH, PA.

914 F STREET, WASHINGTON, D. C.

—AND—

1001 CHESTNUT STREET, PHILADELPHIA, PA.

THE

Inventors' Record and Industrial Guardian,

A SCIENTIFIC JOURNAL

For Patentees, Manufacturers, Engineers, Etc.

Subscriptions 15s. per annum, 7s. 6d. half-yearly, 3s. 9d. quarterly in advance.

23 ROOD LANE, LONDON, ENGLAND.

A. C. NORTHROP,

WATERBURY, CONN.

IRON AND BRASS MACHINE SCREWS,

Zinc in Sheets and Plates

FOR ELECTRICAL PURPOSES.

PARTS FOR TELEGRAPH AND TELEPHONE INSTRUMENTS.

Iron, Brass, Steel or Zinc.

Opportunity to Estimate on patented articles from Sheet Metal, Rod or Brass Castings, respectfully solicited.

J. A. BERLY,

Civil and Electric Light

ENGINEER.

Mechanical and Electrical Patents negotiated for England and the Continent of Europe.

ALL SYSTEMS OF DYNAMO MACHINES, ARC, AND INCANDESCENT LAMPS, ETC., SUPPLIED.

PUBLISHER OF THE

Berly Electrical Directory, Etc.

No. 16 NEW BRIDGE ST.,

LONDON, E. C.,

ENGLAND.

TELEPHONES.

VALUABLE TELEPHONE TERRITORY

To be disposed of under license from American Bell Telephone Company.

TELEPHONE STOCKS FOR SALE.

DELANO & HAINES,

55 Broadway, N. Y.

PAINE & LADD,

HALBERT E. PAINE, Late Comm'r of Patents, STORY B. LADD. } Washington, D.C.

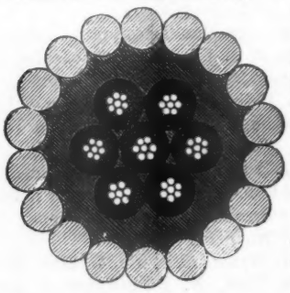
SOLICITORS OF PATENTS,

And Attorneys in Patent Cases.

THE BISHOP

Gutta-Percha Works

(SAMUEL BOARDMAN, Agent)



Original and only Manufacturers in the United States of

GUTTA-PERCHA INSULATED

Submarine Telegraph Cables,

50 Regular Sizes—One to Ten Conductors.

Subterranean Telegraph Cables,

Hempen-Armored Covered.

Aerial Telegraph Cables,

Lead or Hempen Covered.

ANTI-INDUCTION

Telephone (Lead-Covered) Cables,

as used by the Metropolitan Telephone and Telegraph Company.

Torpedo Cables,

Recommended by the European and South American Governments.

Lead-Covered Cables,

For Canal and Streamlet Crossings.

GUTTA-PERCHA

OFFICE WIRE, FUSE, LEADING AND CONNECTING WIRE,

For Subaqueous, Mining and all other Electrical purposes.

MARK'S COMPOUND INSULATED WIRE,

For Office, Outdoor, Underground and Battery Use.

G. P. OFFICE WIRE, COTTON-COVERED.

ALSO HAVE ALWAYS ON HAND

WIRES OF EVERY VARIETY OF INSULATION,

Magnet Wire, Telephone Flexible Cords, Flexible Elevator Cables, Electric Cordage,

BURGLAR-ALARM AND ANNUNCIATOR WIRE,

Electric Light Wire, Cordage and Cables, Lead-Covered Wire, and Every Description of

PURE GUTTA-PERCHA GOODS,

Gutta-Percha Sheet, for Cable Splices; G. P. Chemical Vessels for Acids, etc.

Agents for Reception of Orders and Sale of Goods:

L. G. TILLOTSON & CO., 5 and 7 Dey Street, New York.

WILLIAM HEATON, 508 Chestnut Street, Philadelphia.

Thirty-three years' experience has taught us that neither the electrical nor mechanical qualities of either GUTTA-PERCHA or copper deteriorate by long working or submersion, consequently the best form of a submarine telegraph cable will be that in which these conditions are fulfilled.—*Extract from Report on Cables, by Willoughby Smith.*

Manufactured by

The Bishop Gutta-Percha Works.

Address all communications to

W. W. MARKS, Superintendent,

420, 422, 424 and 426 East 25th Street, New York.

OFFICE AT THE WORKS.

THE

LAW BATTERY

Fig. 1

The BEST Open Circuit Battery in the World and the CHEAPEST.

Combines all the advantages of the best of the others, without any of their disadvantages.

Thousands sold monthly. Send for circular.

Manufactured and sold by the

Law Telegraph Co.

140 FULTON ST., NEW YORK.

JOHN M. PATTERSON,

Patent Broker,

Telephonic and Electrical Apparatus

A SPECIALTY.

91 GRANT STREET.

PITTSBURGH, PA.

WILLIAM LUSK,

Designer & Engraver

ON WOOD,

7 MURRAY STREET,

(NEAR BROADWAY)

Room 54. **NEW YORK.**

Estimates given on Wood Engraving of every description.

HENRY C. ANDREWS, Treasurer.

UNION ELECTRIC MANUFACTURING COMPANY,

Nos. 7 and 9 BOND STREET, NEW YORK.

Finest Electrical Mechanism Made to Order.

Haskins' Electric Lamp, Dynamo-Electric Generators, Telegraph Instruments, Hotel Annunciators, Telephone Shunts for Private Lines, Multiplex Telegraph Apparatus a Specialty.

Electrical Supplies of all kinds. Standard Electrical Books. Experimental Instruments.

PARKER C. CHANDLER, President.

F. W. JONES, Vice-President, (late General Circuit Manager W. U. Telegraph Co.).

RALPH W. POPE, Business Manager (late Deputy Superintendent G. & S. Telegraph Co.).

CHAS. D. HASKINS, Superintendent (formerly of W. U. Telegraph Co.'s Manufactory).

EUGENE F. PHILLIPS,

MANUFACTURER OF PATENT FINISHED

Insulated Telegraph Wire,

TELEPHONE AND ELECTRIC CORDAGE,

ELECTRIC LIGHT WIRE,

MAGNET WIRE, PATENT RUBBER COVERED WIRE,

Burglar Alarm and Annunciator Wire, Lead Encased Wire, Anti-Induction, Aerial and Underground Cables, etc.

OFFICE AND FACTORY,

67 Stewart Street, Providence, R. I.

W. H. SAWYER, Electrician and Superintendent.

L. G. TILLOTSON & CO.

Manufacturers Importers and Dealers in

RAILWAY

TELEGRAPH & TELEPHONE

SUPPLIES

OF EVERY DESCRIPTION,

Nos. 5 & 7 DEY STREET,

NEW YORK.

"Phosphor-Bronze."

Phosphor-Bronze Telephone Wire,

COMBINES HIGH ELECTRICAL CONDUCTIVITY AND RESISTANCE TO CORROSION WITH LIGHTNESS AND TENACITY.

Standard Sizes, 16, 17 and 18, Stubs' Gauge.

ADDRESS:

THE PHOSPHOR-BRONZE SMELTING CO., Limited,

512 ARCH STREET, PHILADELPHIA, PA.

Owners of the United States Phosphor-Bronze Patents, Sole Manufacturers of Phosphor-Bronze in the United States.

J. H. LONGSTREET,

MANUFACTURER OF

Telegraph and Telephone Supplies

OF EVERY DESCRIPTION.

9 Barclay Street

NEW YORK.

THE

CONSTANT CURRENT ELECTRIC GENERATOR,

MANUFACTURED SOLELY BY THE

CONSTANT CURRENT CURE CO.,

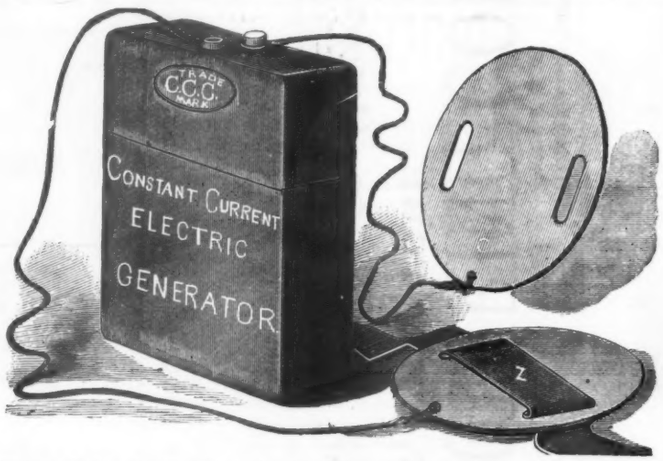
207 MAIN STREET, BUFFALO, N. Y.

This powerful yet simple and compact generator develops a continuous, mild electric current, capable of passing entirely through the human body, affecting every organ, nerve, and tissue, producing marked curative effects.

This current, although so subtle and permeating, is not perceptible to the senses, yet it will operate a galvanometer through a resistance of 5,000 ohms, equal to a telegraph line over 300 miles long.

One of the most remarkable features of this generator, is that it will develop a current continuously for a year with no other attention than the addition of a few drops of water occasionally, and if after long use the chemicals with which it is charged become exhausted, its charge may be renewed for ten cents.

An eminent electrician of New York city says: "Your constant current electric generator possesses three features which render it superior to any electro-medical apparatus yet brought to my notice: 1. It generates a constant and available current. 2. It is perfectly portable, having no free solution that can be spilled. 3. It continues in working order longer than any other form of battery known." Such is the testimony of one who has had years of experience in all branches of electrical science.



The Constant Current Electric Generator

is sent anywhere, by mail, on receipt of the price, $3.00, or by express C. O. D. with collection charges added, with the privilege of examination, but it will add materially to the cost. Inclose 10 cents for registration, and we will guarantee safe delivery of the Generator by mail.

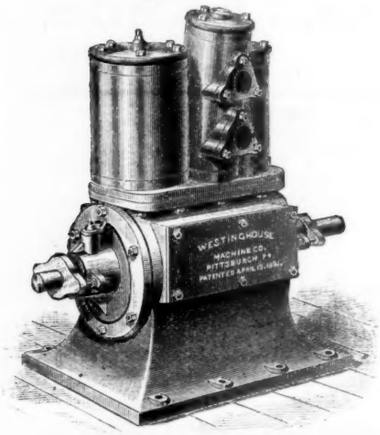
All remittances should be by Postal Money Order, by Draft, or by Registered Letter. We will not be responsible for money sent us in an ordinary letter.

Address the

CONSTANT CURRENT CURE CO.,

207 MAIN STREET, BUFFALO, N. Y.

GEORGE WESTINGHOUSE, Jr., President. RALPH BAGALEY, Secretary and Treasurer. H. H. WESTINGHOUSE, Superintendent.



The Westinghouse Engine

HAS NO EQUAL FOR

ELECTRIC LIGHTING.

May drive Dynamo by direct connection or by belt.

REQUIRES NO COUNTER-SHAFT.

HIGHLY ECONOMICAL.

DISPENSES ENTIRELY WITH SKILLED ENGINEERS.

CANNOT HEAT OR POUND.

And gives a Steadier Light than any other Engine.

Send for Illustrated Circular.

THE WESTINGHOUSE MACHINE COMPANY,

Works at Pittsburgh, Pa. 92 and 94 LIBERTY STREET, NEW YORK.

Waterbury Brass Co.

MANUFACTURERS OF

SHEET BRASS, BRASS RODS,

—AND—

Pure Copper Wire

—FOR—

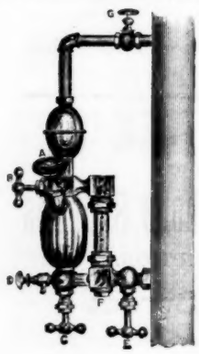
ELECTRICAL PURPOSES.

DEPOTS:

296 BROADWAY, NEW YORK.

125 EDDY ST., Providence, R. I.

Mills at Waterbury, Conn.



THE HOLLAND LUBRICATOR,

Patented July 5, 1881.

MANUFACTURED BY

HOLLAND & THOMPSON,

TROY, N. Y.

For lubricating the Valves and Cylinders of Engines. This is the only Lubricator operating with a downward drop. We do not use the transparent water chamber, which so many parties claim to be the inventors of. A sample will be sent to any responsible party, on 30 days' trial. We do not effect sales by threats, but depend on the merits of our Lubricator.

☞ Why do you suffer the annoyance of hot journals and dripping of oil when you can use our

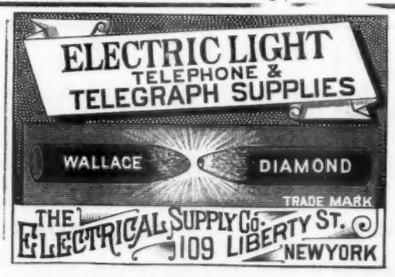
Oline Compound

For all kinds of Machinery. Also Manufacturers of

Graphite Grease,
Axle Grease and
Gear Grease.

HOLLAND & THOMPSON,
217 River Street,
TROY, N. Y.

H. Prentiss & Company,
AGENTS,
42 Dey Street, NEW YORK.



ELECTRICAL BOOKS.

Send name and address for a complete catalogue of Works on Electicity,

ELECTRIC LIGHT AND ELECTRIC TELEGRAPH.

D. VAN NOSTRAND,

23 Murray and 27 Warren Sts., New York.

MITCHELL'S PHONOGRAPHY

A Scientific System of Sound and Sight Writing.

110 Pages, printed on super calendered paper. Cloth sides.

$1.00 PER COPY.

The CHEAPEST and BEST Book on SHORT HAND WRITING published.

C. W. PRATT, Publisher,

73–79 Fulton St., New York.

*** Sent free by mail on receipt of price.

BOOKS FOR ELECTRICIANS!

—:JUST PUBLISHED:—

A Descriptive Catalogue of the Latest and Best Books on

Electricity, Electric Light, Magnetism, &c.

Copies sent free by mail on application to

E. & F. N. SPON,

PUBLISHERS AND IMPORTERS,
44 Murray Street, New York.

If you desire to keep pace with the daily progress and development of Telephone, Telegraph, and Electrical matters, have a copy of the

REVIEW OF THE

Telegraph and Telephone

sent to your address.

Only $2.00 per annum.

Address all communications intended for this paper to

GEORGE WORTHINGTON, Editor and Proprietor,
No. 23 PARK ROW,

P. O. Box 3329, NEW YORK.

This paper will be devoted to the sole purpose of keeping you conversant and thoroughly posted on all topics of an electrical nature, which may be brought out from time to time, in this country and Europe.

WESTERN

ELECTRIC MANUFACTURING COMPANY,

220-232 KINZIE ST., CHICAGO.

62-68 NEW CHURCH ST., NEW YORK.

MANUFACTURERS OF

Telegraph Instruments

AND SUPPLIES.

Insulated Copper Wires, Electric Bells and Annunciators, Burglar Alarms, the Electro-Mecurial Fire Alarm, Electro-Medical Apparatus, Electric Gas-Lighting Apparatus, Edison's Electric Pen and Duplicating Press, the Gamewell Fire Alarm Telegraph Apparatus, Bi-Polar and Carbon Telephones, Telephone Exchange Apparatus, Underground Cables.

ANSON STAGER, President. ENOS M. BARTON, V-Prest.
ELISHA GRAY, Electrician.

CATALOGUES

Sent by mail on receipt of price in stamps or currency.

	Pages.	Price.
I—Complete Set of Catalogues	236	20c.
II—Telegraph Instruments and Supplies	64	6c.
IV—Insulated Wire (included in II).		
V—Electric Bells, Annunciators, Electro-Mercurial Fire Alarm	32	3c.
VI—Electro-Medical Apparatus	32	
VII—Manual of Telegraphy and Catalogue of Private Line Instruments	32	free.
VIII—Condensed Price List	20	free.
X—Electric Bells, etc Descriptive	12	3c.
XI—Magnets for Mills	20	3c.
Sir Wm. Thomson's Nautical Instruments	24	5c.

EXTRACTS FROM

CHORDAL'S LETTERS.

One of the most interesting books for manufacturers, mechanics, or business men ever published. A great variety of mechanical and business topics treated in a wise and witty way that will be instructive to old and young, and interesting to every body.

The book contains 320 pages, 12mo, and over 40 Humorous Illustrations.

PRICE, $1.50 PER COPY; BY MAIL TO ANY ADDRESS.

PUBLISHED BY

American Machinist Publishing Co.

96 FULTON ST., NEW YORK.

Photographic Instruments.

The Art of Photography

Complete without a Teacher.

From $6.00 up; send 10c. for Circular and Catalogue, to

AUGUST HERZOG, 36 John St., N. Y.
Manuf'r of Photo. Instruments.

THE "WATERBURY"

One Every Minute,

Six Hundred Daily

Are being manufactured and sold by the

WATERBURY WACTH CO.

WATERBURY, CONN.

Send for Circular.

NEW YORK OFFICE, - - 4 MAIDEN LANE.

GEO. MERRITT, Agent.

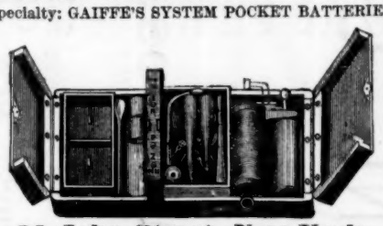
E. W. WAGNER,

Manufacturer of

ELECTRO-MEDICAL APPARATUS.

Specialty: GAIFFE'S SYSTEM POCKET BATTERIES.

Send for Catalogue and Prices.



Awarded First Medal at Cincinnati Exposition, 1880.

36 John Street, New York.

WM. DAWSON & SONS,

EXPORT STATIONERS,

Indian and Colonial Agents,

BOOKSELLERS & NEWSVENDERS,

Sole Agents for Great Britain for the

NEW YORK REVIEW

—OF THE—

Telegraph & Telephone,

AND ELECTRICAL JOURNAL,

SUBSCRIPTION RATE, 10s. Per Annum.

No. 121 CANNON STREET,

LONDON, E. C., ENGLAND.

J. A. BERLY'S

BRITISH AND CONTINENTAL

Electrical Directory

AND ADVERTISER,

FOR 1882,

IS NOW PUBLISHED AT

J. A. BERLY'S, 16 New Bridge St., London, E. C.

PRICE, FIVE SHILLINGS ($1.25.)

By Post—Registered—5/6 ($1.35.)

Firms in the U. S. and Canada desirous of their names and addresses appearing in the next issue (1883) *should at once communicate with the publisher, supplying him with particulars, prospectus, catalogue, etc.*

All persons ordering articles advertised in our columns will do us and our advertisers both a great favor by mentioning that they saw the advertisement in this paper.

Entered according to Act of Congress, in the year 1882, by George Worthington, proprietor and publisher, New York, in the office of the Librarian of Congress, at Washington, D. C.

WESTERN ELECTRIC MANUFACTURING CO.

CHICAGO AND NEW YORK.

Telegraph and Telephone Apparatus and Supplies.

THE BEST OF EVERYTHING AT BOTTOM PRICES.

220—232 KINZIE STREET, CHICAGO. 62—68 NEW CHURCH STREET, NEW YORK.

A. C. DAY,

Manufacturer of

KERITE INSULATED

Telegraph and Telephone

WIRE AND CABLES.

OFFICE, 120 BROADWAY, NEW YORK.

FACTORY, SEYMOUR, CONN.

ANTI-INDUCTION KERITE

TELEPHONE CABLES.

Some of them TWO MILES IN LENGTH, are in use in several cities, and are found to WORK PERFECTLY for that distance.

Eminent Electricians and Practical Telegraphists

Commend and recognize the Kerite insulation as superior to all others. At the CENTENNIAL EXHIBITION at Philadelphia, Sir WILLIAM THOMSON, the eminent Electrician and Scientist, awarded to the

KERITE INSULATED WIRE AND CABLES

A DIPLOMA

For "Excellence of the Insulation and Durability of the Insulator."

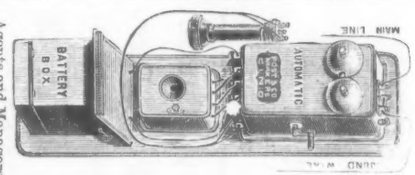
CLARK B. HOTCHKISS, GEN. AGT.

120 BROADWAY, NEW YORK.

Telegraph & Telephone Department.

POST & COMPANY,

CINCINNATI, OHIO.



LICENSED MANUFACTURERS OF

American Bell Telephone Co.'s

MAGNETO AND ELECTRO

CALL BELLS, &c.

Manufacturers of all kinds of

Telephone Instruments, Bells, Plugs, Switch Boards, Annunciator Drops, Spring Jacks, Magneto Engines for Switch Tables, and dealers in all kinds of *Telephone Supplies* and Tools; in stock and for sale at lowest prices.

Galvanized Line Wire, all numbers; Insulated Wire, all number; Insulators and Brackets, all sizes; Batteries, all kinds and sizes, at lowest prices.

FULL ASSORTMENT OF

Telegraph Instruments.

Agents and Managers of Exchanges are requested to correspond with us before purchasing.

We call special attention to our new improved Magneto Call Bells. Samples sent on application to Agents and exchanges.

POST & CO., Cincinnati, O.

HOLMES, BOOTH & HAYDENS,

MANUFACTURERS OF

SHEET BRASS, BRASS WIRE, RODS AND TUBING, COPPER RIVETS AND BURS.

Pure Lake Superior Copper Wire

FOR ELECTRICAL PURPOSES.

Patent "K K" Insulated Copper and Iron Wire.

THE IRON IS SPECIALLY ADAPTED FOR TELEPHONE USE.

Prof. HENRY MORTON says :—"I have tested it with "Ozone," which concentrates the atmospheric influences of years into an hour, and find that it stands this thoroughly."

No. 49 Chambers Street, New York. **No. 506 Commerce Street, Philadelphia.** **No. 18 Federal Street, Boston.**

WORKS AT WATERBURY, CONN.